# Psychosocial mediators of the relationship between sexual minority status and depressive symptoms in a longitudinal sample of young people

Argyriou, Angeliki

*Awarding institution:*
King's College London

# Volume I
# Systematic Literature Review
# Empirical Research Project

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**Angeliki Argyriou**

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King's College London

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## Volume I Contents

SYSTEMATIC LITERATURE REVIEW

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# Factors that mediate the disparities in depression between sexual minority and heterosexual individuals

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**Angeliki Argyriou**

Supervised by Dr Katharine Rimes & Dr Kimberley Goldsmith

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ABSTRACT

**BACKGROUND**: Evidence suggests that sexual minorities (e.g. those identifying as lesbian, gay or bisexual) experience increased rates of depression compared to heterosexual individuals.

**AIM**: This review provided a systematic examination of research assessing the evidence for factors that help explain such disparities.

**METHODS**: A literature search was conducted using the databases PubMed, PsycINFO, and Web of Science. The review included 33 identified studies that examined mediators of sexual minority status and depressive outcomes using a between-group design (i.e. heterosexual versus sexual minority participants). Studies of adolescents and adult samples were both included.

**RESULTS AND CONLUSIONS:** The most common findings suggested that minority stressors (e.g. victimisation), increased stress, and lower social support lead to differing depression rates in sexual minority compared to heterosexual individuals. All papers had methodological shortcomings such as the use of cross-sectional designs, inferior statistical analyses for mediation, or measures that had not been properly validated. Recommendations for future research are discussed.

*Keywords*: sexual minority, sexual orientation, depression, mediation

# 1. Introduction

## 1.1. Sexual Minorities and Depression

Systematic reviews have reported that sexual minority individuals (e.g. those identifying as lesbian, gay or bisexual) have elevated rates of mental health problems and are as much as four times more like to attempt suicide (King et al., 2008; Plöderl & Tremblay, 2015). In the UK, sexual minority adults have been found to be more than twice as likely than their heterosexual peers to experience mental health problems (Semlyen, King, Varney, & Hagger-Johnson, 2016) and make increased use of health services for reasons of mental health (Chakraborty McManus, Brugha, Bebbington, & King, 2011).

A strong link has been consistently demonstrated between sexual minority status and depression in particular, with studies reporting that sexual minority adults experience higher prevalence of depression symptomatology than heterosexuals (e.g. Chakraborty et al., 2011; Pakula & Shoveller, 2013). A meta-analysis found that the risk of 12 months prevalence of depression in sexual minority individuals was at least twice that of heterosexual controls (King et al., 2008). Similar prevalence rates have been found for sexual minority youth (e.g. Almeida, Johnson, Corliss, Molnar, & Azrael, 2009; Grant et al., 2014; Hatzenbuehler, McLaughlin, & Nolen-Hoeksema, 2008; Marshal et al., 2011), suggesting that disparities in depression between LGB and non-LGB individuals may appear early in life.

Although it is known that these disparities exist, less is known about the mechanisms through which they come about. Having a better understanding of the intermediate factors that lead to depression in this population would be instrumental for designing and refining effective prevention programmes that would protect at-risk LGB individuals and developing targeted therapeutic approaches for LGB people who experience depression.

Different theoretical accounts have been put forth to explain the increased rates of depression in sexual minority individuals. According to minority stress theory, being a member of a minority group exposes individuals to different adversities that contribute to mental health problems (Meyer, 2003). Meyer suggested that such minority stressors may be distal or external to the person or proximal or internal processes of how the individual relates to their identity. Distal stressors include prejudice events such as discrimination and violence, while proximal events include sexual minority-specific internalised

stressors such as internalised homophobia, expectations of rejection, and concealment stress. Indeed, evidence suggests that LGB individuals face multiple stressors early in their lives, including peer victimisation, physical assault, abuse, and rejection from family and friends (e.g. Corliss, Cochran, & Mays, 2002; Balsam, Rothblum, & Beauchaine, 2005). There is also a lot of research that suggests that sexual minority individuals experience a multitude of internal minority stressors such as perceived stigma and expectations of rejection and discrimination, stress about disclosure and concealment, and internalised negative attitudes about their sexual identity (see Meyer, 2003 for a review). However, less research has been focused specifically on whether such minority stressors help explain disparities in mental health problems.

Hatzenbuehler (2009) expanded on minority stress theory, by suggesting that the increased stress that sexual minority individuals are exposed to is likely to increase the likelihood of maladaptive cognitive processes, unhelpful coping and emotion regulation strategies, and reduced social support, all of which may in turn increase the risk for mental health problems. Hatzenbuehler was interested in what mediates the relationship between the societal stressors that sexual minorities are exposed to and psychopathology. His model hence added a level in the theoretical mediation hypothesis that Meyer put forward by including the ways that stigma-related stressors "get under the skin" of sexual minority individuals. Moreover, while Meyer's work highlighted sexual-minority-specific psychological stressors (e.g. internalised homophobia), Hatzenbuehler's model also included general psychological processes that are known vulnerabilities in the general population. Hatzenbuehler's model distinguished between group-specific and general processes and suggested that disparities in mental health outcomes between heterosexuals and sexual minorities can also be explained by the increased levels of non-group specific psychological processes that confer risk to psychopathology.

Meyer's and Hatzenbuehler's theoretical models demonstrate the importance of understanding the factors that help explain the mental health inequalities that sexual minorities face. A mediation model as proposed by Hatzenbuehler (2009), would enable the development of policies and interventions that can target such inequalities both on a structural/societal level and on the level of the individual.

### 1.2. Mediation Analysis

Meyer's (2003) and Hatzenbuehler's (2009) theoretical models seek to understand the

intermediate factors that explain how sexual orientation leads to increased risk for psychopathology. Methodologically, mediation analysis lends itself well to examining hypotheses about causal pathways wherein intermediate mechanisms (rather than only two variables) are involved. As Meyer (2003) asserted, between-group studies in the literature often examine the predictor (sexual minority status) and the outcome (mental health problems) and assume the existence of intermediate stress-related mechanisms. On the other hand, within-group studies (that only examine sexual minorities) have been traditionally used to shed light on the mechanisms of minority stress processes. While the latter approach may explain why some sexual minority individuals develop mental health problems while others do not, it does not, on its own, address the reasons why prevalence rates are higher in sexual minorities compared to heterosexuals. Mediation analysis explains such disparities with reference to intermediate stress-related mechanisms and has therefore been used in the recent literature in this research area.

The process of mediation is that whereby an independent variable is thought to cause change in an intervening variable which in turn causes change in the dependent variable (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In this sense, a mediation theory will generally constitute a causal chain of events; the plausibility of these causal relationships needs to be considered and justified in each case. A classic paper on mediation analysis by Baron and Kenny (1986) outlines the Causal Steps approach. This approach specifies a series of regression model tests of associations in a causal chain: 1) Independent variable is associated with the dependent variable (total effect, path c); 2) the independent variable is associated with the mediator (path a); 3) the mediator is associated with the dependent variable (path b); and 4) the effect of the independent on the dependent variable reduces or disappears when the mediator is controlled for (direct effect, path c'). These relationships are depicted diagrammatically in *Figure 1*. According to Baron and Kenny (1986), if these criteria are met then there is evidence of mediation. More recently, it has been widely agreed that where there is a mediation theory (i.e. in a clinical trial of an intervention), a significant total effect (Step 1 in the Causal Steps approach) is not a necessary prerequisite to a mediation analysis (Emsley, Dunn, & White, 2010; Goldsmith, Chalder, White, Sharpe, & Pickles, 2016; MacKinnon & Dwyer, 1993; MacKinnon, 2008). In fact, in the absence of a total effect, it may be more important to do a mediation analysis in order to understand why this was the case. Also, the Causal Steps approach went as far as to establish conditions for mediation, however, Baron and Kenny (1986) discussed neither how to calculate a product of coefficients indirect

(mediated) effect and associated 95% confidence interval, nor how to make inferences about this effect, which are necessary for quantifying mediation. The literature since has contributed the calculation of a product of coefficients mediated effect (a path x b bath), tests of the joint significance of paths a and b, the Sobel test of significance of the indirect effect and bootstrapping to calculate mediated effect confidence intervals (MacKinnon, 2001; MacKinnon et al., 2002; MacKinnon, Lockwood, & Williams, 2004; Sobel, 1982; Sobel, 1986). In addition, in recent years, the importance of confounding variables and bias in mediation analysis has come to the forefront (Emsley et al, 2010; Goldsmith et al., 2016; Imai, Keele, & Tingley, 2010; Imai, Keele, & Yamamoto, 2010; MacKinnon, 2008; Robins & Greenland, 1992; VanderWeele & Vansteelandt, 2009). It is key for researchers to consider all important potential confounders of the relationships in the mediation models and to measure and include these in models. The baseline measures of the mediators and the dependent variable are likely important confounders, and at the very least these variables should be included (Dunn, Emsley, Liu, Landau, 2013; Pickles et al., 2015).

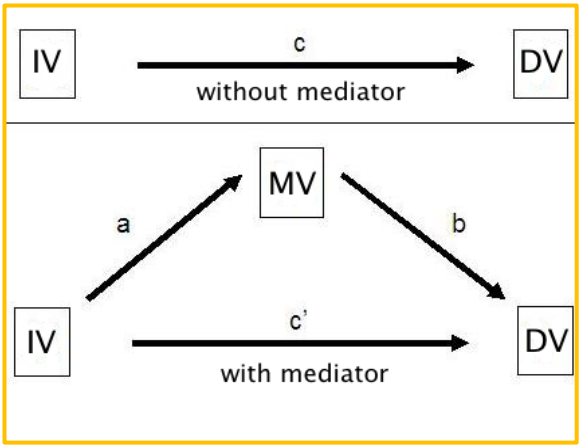


*Figure 1.* A mediation model.

Mediation analysis can be conducted via a series of regression models (for example, see Goldsmith et al., 2016; MacKinnon, 2001; MacKinnon, 2008; MacKinnon & Fairchild, 2009). However, Structural Equation Modelling (SEM) methods can also be used, one advantage being the ability to fit the mediation model shown at the bottom of *Figure 1* in a single step. In addition, software developed for SEM often automatically provides indirect effect estimates and associated confidence intervals (Goldsmith et al., 2017).

One key assumption in mediation analysis and the establishment of causal relationships in general is temporal ordering (Cole & Maxwell, 2003). A causal chain is postulated

from the independent variable to the mediator and then from the mediator to the dependent variable. This implies that the independent variable should be measured first, followed by measurement of the mediator at an intermediate time, with the dependent variable measured last. Longitudinal studies that allow for such temporality are therefore considered methodologically superior.

Considering the statistical power of mediation studies is important, as low power is probably a key reason for non-significant results (Ma & Zeng, 2014). Moreover, estimating the required sample size to detect a mediation effect requires special considerations (Fritz & MacKinnon, 2010), and it is therefore important that researchers report it in order to evaluate their findings.

### 1.3. The Current Study

In recent years, research has been focused on the aetiology for mental health disparities between heterosexual and sexual minority youth and adults, by looking at mediators of the relationship between sexual orientation and depressive symptomatology. Examining mediators can help us better understand the mechanisms through which both sexual minority status and the stigma associated with it confer risk for depression (Hatzenbuehler, 2009). No study to date has systematically reviewed between-group studies that use mediation analysis to examine evidence regarding different psychosocial factors that may explain the differences in rates of depression between heterosexual and sexual minority individuals.

The present study's aim is therefore to identify the factors that mediate the relationship between sexual minority status and depressive symptoms by systematically reviewing research studies in the literature that use mediational approaches to investigate the disparities among heterosexual and sexual minority individuals.

## 2. Method

### 2.1. Data Sources and Search Strategy

A search of published studies was conducted using the following electronic databases: PsychInfo, PubMed, and Web of Science. The search term was: (LGBT OR sexual minorit* OR sexual orientation OR gay OR lesbian OR bisexual OR queer OR homosexual* OR LGB OR non-heterosexual) AND (Heterosexual* OR nonminority)

AND (depress* OR mood) AND (mechanism* OR mediat* OR predict* OR factor* OR explain OR caus* or risk factor or structural equation model*). Additional studies were retrieved by cross-referencing of selected articles, and through hand searches. This literature search was completed on 27th October 2017.

### 2.2. Inclusion and Exclusion Criteria

We included studies that: 1) were published in peer reviewed journals; 2) included a statistical group comparison between heterosexual and sexual minority status individuals; 3) used a measure of depressive symptoms or a diagnosis of depression as an outcome variable; 4) used analyses that can be used to test possible mediation effects with sexual orientation as the independent variable and depression as the dependent variable. We excluded studies that: 1) were non-empirical (reviews or theory papers); 2) did not have the full description of the study available (e.g. conference abstracts); 3) were published in languages other than English. We did not exclude studies based on publication year, sample size, age groups used, or whether they used a subsample of the population of interest. An initial screening of all title and abstracts was conducted. A second independent reviewer screened a random 10% of all the titles and abstracts and all the full-text papers that met the eligibility criteria based on the initial screening. The Kappa statistic was used to measure inter-rater agreement.

### 2.3. Data Extraction

The following data were extracted from included studies: study title; authors; year; design (cross-sectional or longitudinal); country / setting; population / sample characteristics; recruitment strategy; total and group sample size; sexual orientation measure; hypothesised mediator(s); measure(s) for mediator(s); depression measure; confounders; type of mediation analysis (series of regression or SEM); test of significance for mediation; statistical analysis details; main findings; and limitations. The results of studies were summarised using a narrative synthesis approach, due to the heterogeneity of study designs and mediation methodologies.

### 2.4. Quality Assessment

A quality assessment measure developed for treatment mediation studies by Lubans, Foster, and Biddle (2008) and then expanded in other studies (Cerin, Barnett, & Baranowski, 2009; Mansell, Kamper, & Kent, 2013; Lee et al., 2015), was further adapted for the purposes of this study. This included four additional items being added from the

Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (US Department of Health and Human Services, 2014) and the Quality Assessment Tool for Quantitative Studies (Effective Public Health Practice Project, 2003) to address the methodological quality of the independent variable, sampling procedures, representativeness, and response/uptake. The quality assessment focused on the mediation hypotheses of the studies that were relevant to this review. A score for each study was computed by assigning a value of 0 (no) or 1 (yes) to each of 12 questions, listed in *Table 1*. If a study did not explicitly report information related to an item, it was assigned 0 for that item. Studies which scored 0-4 were classified as of *poor* quality, 5-8 were classified as of *fair* quality, and 9-12 were classified as of *excellent* quality. For Item 6 (statistically appropriate/ acceptable methods of data analysis were used), studies were assigned 1 if they conducted and reported a test of significance for the mediated effect either through testing of the product of coefficients (e.g. Sobel test, bootstrapping) or joint testing of the a and b paths, as recommended by MacKinnon et al. (2002). Studies were assigned a 0 if they solely used the Causal Steps approach (Baron & Kenny, 1986) or other approaches to mediation such as SEM without testing for statistical significance of the indirect effect. Quality assessment ratings were done by two raters, and discrepancies were resolved through discussion.

Table 1.

*Quality assessment tool.*

| **Item:** | **Score:** 0 / 1 |
|---|---|
| 1. Did the study cite a theoretical framework? | |
| 2. Was the independent variable clearly defined, valid (face validity), and reliable, and implemented consistently across participants? | |
| 3. Were the psychometric characteristics of the mediator variable reported and were they within accepted ranges? (Computed from the present study or a reference provided) | |
| 4. Were the psychometric characteristics of the depression variable reported and were they within accepted ranges? (Computed from the present study or a reference provided) | |
| 5. Did the study report a power calculation? If so, was the study adequately powered to detect mediation? | |
| 6. Were statistically appropriate/ acceptable methods of data analysis used? | |
| 7. Did the study ascertain whether changes in the mediating variable preceded changes in the outcome variable? | |
| 8. Did the study ascertain whether changes in the predictor variable preceded changes in the mediator variable? | |
| 9. Did the study control for possible confounding factors? | |
| 10. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants? | |
| 11. Are the individuals selected to participate in the study likely to be representative of the LGB and heterosexual population? | |
| 12.<br>a) Was 80% or more of potential participants included at point of relevant analyses?<br>b) If the study was longitudinal, was loss to follow-up after baseline 20% or less? | |

## 3. Results

### 3.1. Included Studies

The search identified 1207 studies, 510 of which were duplicates. Of the remaining 697 studies, 595 were excluded based on the title or the abstract, thus the number of full-text articles assessed for eligibility was 102. Interrater agreement about decisions to include studies or not was very good, $\kappa = .939$ (95% CI: 0.87, 1.00). Discrepancies were resolved through discussion relevant to the inclusion and exclusion criteria. The final number of studies meeting the inclusion and exclusion criteria and therefore included in the review was 33. *Figure 2* illustrates the flow of studies. For the purposes of this review, these papers are subsequently referred to by numbers (see Appendices for the list of papers and their corresponding numbers).

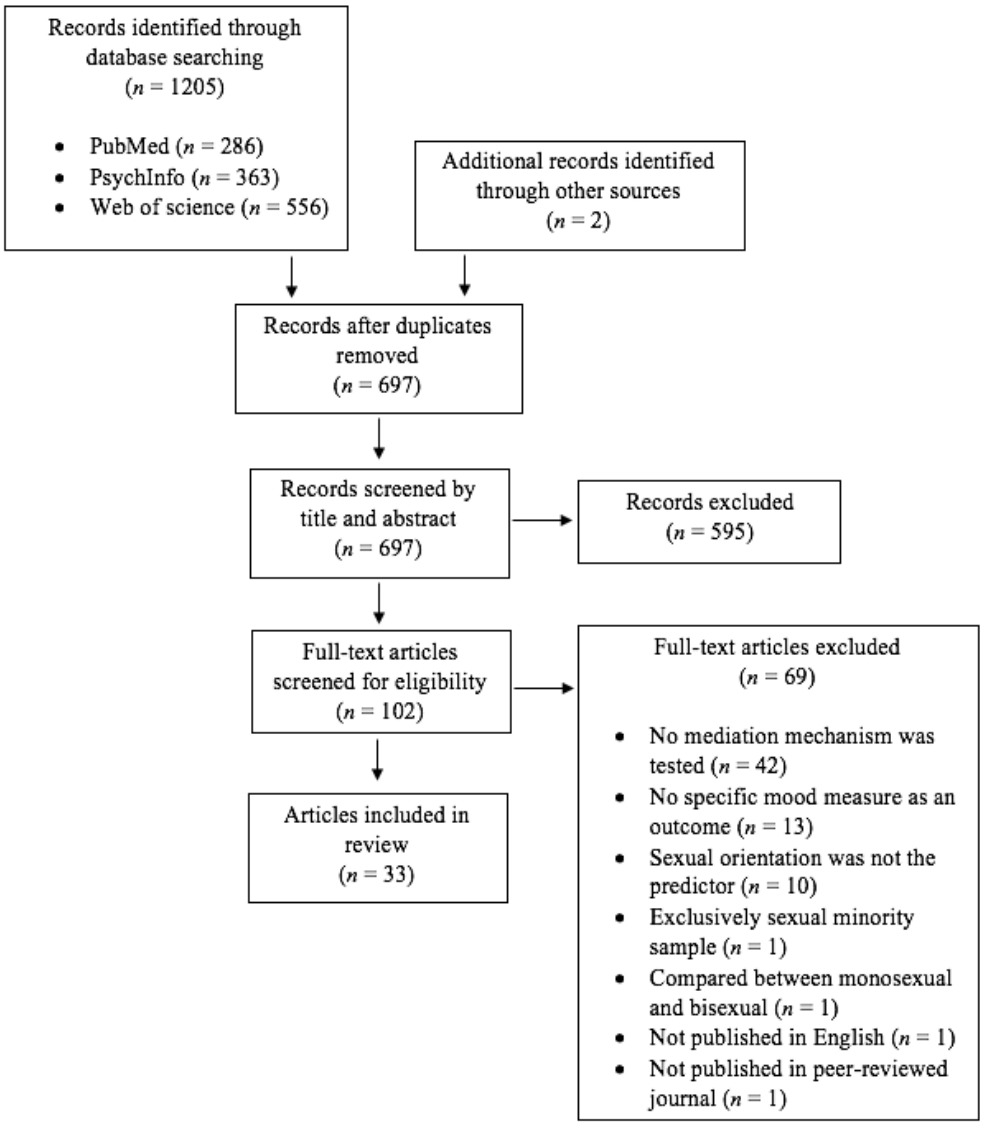


*Figure 2*. Study flow diagram

### 3.2. Quality Assessment

The results of the quality assessment are shown in Appendix A. Most studies were rated as having *fair* methodological quality. Three studies were rated as being of *good* quality and seven studies rated as being of *poor* methodological quality.

### 3.3. Theoretical Framework

Many of the studies derived their research questions from broader theoretical frameworks relating to sexual minority individuals' increased exposure to social stress (papers *1, 3, 4, 5, 6, 9, 10, 11, 15, 19, 21, 22, 25, 27, 28, 30, 33*), with the most often-cited theory being minority stress theory (Meyer, 2003). A few studies (*8, 12*) cited Hatzenbuehler's (2009) psychological mediation model that focuses on the mechanisms through which exposure to social stressors renders sexual minorities more vulnerable to mental health problems. Similarly, other studies explored normative psychosocial processes that have been established as risk factors in the general population and sought to explore their specific associations with sexual minority identity (*7, 22, 25, 30, 28, 31*). Other explanatory hypotheses pertaining to the sexual orientation disparities in mental health problems were also examined including: the role of unmeasured genetic and shared environmental factors (*4, 5*); the differential incidence and impact of sexual and physical violence in sexual minority populations (*17, 19, 26, 32*); the interacting role of gender and sexual orientation (*29*); childhood adversity (*2, 15*); cultural-specific factors associated with concealment of sexual orientation (*32*); theory of human relatedness and social belonging (Hagerty, Lynch-Sauer, Patusky, & Bouwsema, 1993) (*13, 14*); and the importance of family support and attachment for this population (*18, 20, 24*).

### 3.4. Study characteristics

Study characteristics are summarised in Appendix B. Of the 33 studies, 23 had a cross-sectional design and 10 had a longitudinal design. The longitudinal studies reviewed either measured sexual orientation and mediator at time 1 and depression at time 2 *(7, 10, 20, 22, 23, 24, 30)* or sexual orientation at time 1 and mediator and depression at time 2 *(2, 3)*, with none of the studies collecting measures of the three variables at three different time points.

Most of the studies took place in the United States ($n$ = 21), while some took place in Australia ($n$ = 5), in Sweden ($n$ = 2), in the UK ($n$ = 1), in the Netherlands ($n$ = 1), in China ($n$ = 1), and in Canada ($n$ = 1). One study took place in both the US and Canada.

### 3.5. Population

The studies contained data on 360,417 exclusively heterosexual and 15,837 sexual minority individuals (including 2007 individuals who identified as mainly heterosexual). Of the 33 studies, 11 had predominantly early to late adolescent samples (*1, 3, 4, 7, 8, 10, 12, 20, 23, 25, 30)*, 12 had young adult or university student samples *(11, 15, 18, 21, 22, 24, 27, 28, 29, 31, 32, 33)*, eight used exclusively adult samples *(5, 6, 9, 13, 14, 17, 19, 26)* while one study used both a young adult and an older adult cohort *(16)* and another study used a young adult and mid-adult sample *(2)*. Five studies used an exclusively female sample *(9, 13, 16, 26, 29)* while one study used an exclusively male sample *(14)*. Some of the studies used subsamples of the population. One study had a sample of sexual assault survivors *(26)* while in another, participants were victims of intimate partner violence *(17)*. Some studies used other samples that may limit the generalizability of their findings: Two studies used samples of twin siblings *(4, 5)*, one study used a sample of children of registered nurses *(24)*, another study used a sample of medical students *(21)*, and another used a sample of undergraduate psychology students *(27)*. More details about the design, sample, and study characteristics are found in Appendix B.

### 3.6. Measurement of sexuality

Sexuality was assessed in a number of ways. Most studies used sexual identity or sexual orientation questions and response options *(1, 2, 4, 9, 10, 11, 13, 14, 15, 16, 18, 19, 21, 22, 23, 26, 28, 29, 32, 33)*. Six studies asked about sexual or romantic attraction *(3, 7, 8, 20, 24, 30)*, and one asked about preference for romantic partners *(12)*. One study asked about gender of individuals that were in relationship with *(17)* and two studies enquired about the number of people of the same-sex and the opposite-sex participants had sexual intercourse with *(5, 31)*. There was one study that asked about identity but encompassed behavioural indicators in the response options (e.g. "homosexual with some heterosexual experience") *(25)*. Two studies did not report how they assessed sexuality *(6, 27)*.

Responses available also varied greatly with studies using from three to six categories of sexuality, and one study using a fill in blank response. Most studies proceeded with categorising sexual minority and heterosexuals into two groups, with some citing power concerns about distinguishing among more sexual minority groups. Six studies used three categorisations, including a *bisexual* group *(2, 8, 15, 18, 19, 29)*; two studies used four groups (*gay/lesbian*, *bisexual*, *mostly heterosexual*, and *heterosexual*) *(16, 24)*; one study used five categorizations (*lesbian, mostly lesbian, bisexual, mostly heterosexual,*

*heterosexual*) *(9)*; while another study analysed using two different categorisations, the first with two categories and the latter with three categories including a *bisexual* group *(10)*.

Studies often included response categories such as *mostly homosexual*, *mostly heterosexual*, *other*, and *questioning*, but they varied on how they later treated these responses. For example, while some studies included participants who selected *mostly heterosexual* in the sexual minority group *(3, 9, 32, 33)*, one study placed them in the heterosexual group despite having a bisexual category in their analysis *(18)* and another study excluded them from the analysis *(26).* Similarly, participants who chose *other* were either placed in the sexual minority group *(4, 21, 22),* or were excluded from the analysis *(13, 14). Attracted to neither males or females (15), not sure (24)*, and individuals with no sexual experience *(5)* were excluded from the analysis, while a study that included a *questioning* response, placed the participants selecting it in the sexual minority group *(32)*. Finally, three studies excluded participants who identified as *bisexual* from the analysis *(13, 14, 28)*.

### 3.7. Outcome Measures

Most studies used validated self-report measures of depressive symptoms including the Center for Epidemiological Studies Depression (Kohout, Berkman, Evans, Cornoni-Huntley, 1993; Radloff, 1977) *(3, 4, 5, 6, 8, 15, 16, 18, 20, 24, 26, 27, 28, 29, 31)*, the Beck Depression Inventory II (Beck, Steer, & Brown, 1996) *(11, 25)*, the Depression Anxiety Stress Scales (Lovibond & Lovibond, 1995) *(13, 14, 22)*, the Modified Depression Scale (Orpinas, 1993) *(1)*, the Youth and Adult Self-Report (Achenbach & Rescorla, 2001; Achenback & Rescorla, 2003) *(10)*, the Hospital Anxiety and Depression Scale (Chinese version; Leung, Ho, Kan, Hung, & Chen, 1993) *(32)*, the Brief Symptom Inventory (Derogatis, 1993) *(33)*, the Goldberg Depression & Anxiety Scale (Goldberg, Bridges, Duncan-Jones, Grayson, 1988) *(2)*, the PROMIS Emotional Distress-Depression scale (Pilkonis et al., 2011) *(21)*, and the Children's Depression Inventory (Kovaks, 1992) *(7, 12).* Two studies used items that were validated as a scale or as a latent variable for the purposes of their study *(23, 30)*. One study used diagnostic interview questions to code participants as having or not having depression *(9)*. Some studies asked questions that had not been validated regarding the presence of a diagnosis of depression and then used them to classify participants as having or not having depression *(17, 19)*. One study used both a self-report and questions about history of depression as outcomes *(16)*, while

another study used both the Structured Clinical Interview (SCID) and a self-report measure *(5)*.

### 3.8. Mediators

Included studies used a variety of variables as hypothesized mediators of the relationship between sexual minority status and depression. Only two studies assessed the independent variable at an earlier time point than the mediator *(2, 3)* and seven studies assessed the mediator before the outcome *(7, 10, 20, 22, 23, 24, 30)*. Almost half of the studies used measures of the proposed mediators for which evidence of validity and reliability was limited or not provided. Most studies used one or two mediators in their analysis while others analysed multiple mediators. Some studies used a mediator assessed by a single question not associated with a validated scale. Details about the constructs and measures used as mediators are found in Appendix C.

Many of the studies looked at self-reports of victimisation, harassment, discrimination, or interpersonal mistreatment as mediators *(1, 3, 4, 5, 9, 10, 11, 12, 17, 23, 31, 33)*. Of these studies, four looked at victimisation specifically due to sexual minority status *(1, 3, 11, 12)*, seven looked at victimisation in general *(4, 5, 9, 10, 17, 23, 31)*, and one looked at vicarious exposure to both general and heterosexist harassment *(33)*. A few studies looked specifically at lifetime abuse *(16)*, interpersonal violence *(29)*, and dating violence *(32)*.

Many studies used more general stress-related mediators such as non-event stress *(6)*, exposure to adversity *(15)*, perceptions of stress *(16, 19, 22, 25)*, negative life events *(31)*, exposure to social stressors *(21, 30)*, and chronic strain *(31)*. One study examined physical health and health-related behaviours *(2)*.

One study looked at general major life events including age of moving out of parental home, age of first sexual experience, age moved in with first partner, and sexual abuse *(2)*, while another study looked at factors related to sexual relationships including relationship status, number of sexual relationships, and whether participants had their first sexual experience early in life *(31)*. One study used sexual orientation concealment as a mediator *(32)*.

Some studies looked at family-related mediators such as parental rejection *(10)*, family

support *(12, 18, 20, 31)*, closeness and involvement with parents *(20)* and attachment and maternal affection *(24)*. Studies also looked at other types of support including social or emotional support *(2, 16, 17, 25, 26, 28, 30)*, social isolation, degree of connectedness and social status *(8)*, frequency of social contact *(26)*, friendship quality *(12)*, friend support *(31)*, as well as quality of the school environment *(12)*, sense of belonging *(14, 15)*, and institutional betrayal *(27)*.

Studies also explored intrapersonal factors such as emotional regulation (*7*), self-regulation (*12*), coping styles (*22, 25*), self-concept (*12, 31*), mastery (*28, 31*), behavioural activation and inhibition *(2)*, optimism *(31)*, fun-seeking orientation *(31)*, and a sense of mattering *(31)*.

### 3.9. Confounders

The overwhelming majority of studies controlled for some confounders with most studies controlling for demographic variables (e.g. age, gender, ethnicity/race, place of residence, education, income, family structure, relationship status). Only a few studies controlled for baseline levels of depression *(3, 7, 10, 12, 22, 23)*. A few studies also controlled for familial confounding *(4, 5, 24)* and parental psychopathology *(9, 12)*. One study included history of adverse childhood experience as a confounder *(32)* while three studies controlled for violence and victimisation *(8, 12, 23)*. One study controlled for social desirability *(21)* and another study that used different recruitment methods included recruitment method as a confounder *(11)*. A minority of studies did not use any confounders *(1, 25, 27)*.

### 3.10. Statistical Analysis

The statistical approaches undertaken in the papers are shown in Appendix D. Only three of the studies reported power calculations *(8, 24, 28)*. With regard to data analytic approaches, many of the studies followed mediation procedures similar to the Causal Steps approach proposed by Baron and Kenny (1986), while some of the studies used SEM. Many of the studies did not conduct a test for the mediated effect either through testing the significance of the product of coefficients estimate of the indirect effect, or joint testing of the a and b paths.

### 3.11. Findings

The key findings of each study can be found in Appendix D and the findings are also

summarised below.

### 3.11.1. Discrimination / victimisation

Many of the studies explored victimisation-related variables as mediators in the relationship between sexual orientation and depression. Almeida et al. (2009), found perceived sexual orientation-specific discrimination to be a mediator in a sample of high school students. Similarly, Burton, Marshal, Chisolm, Sucato and Friedman (2013) found victimisation due to actual or perceived sexual orientation status to be a mediator in an American study, while Robinson, Espelage and Rivers (2013), and la Roi, Kretschmer, Dijkstra, Veenstra and Oldehinkel (2016) both found peer victimisation to be a mediator in longitudinal studies with young people in the UK and the Netherlands respectively. Furthermore, Ueno (2010) found that both victimisation and daily discrimination attenuated the relationship between same-sex contact and depressive symptoms. Harassment due to sexual minority status was also found to mediate depression in another adolescent sample (Martin-Storey & Crosnoe, 2012). Woodford, Han, Craig, Lim and Matney (2015) found that experiencing aspects of interpersonal mistreatment, in the form of incivility and heterosexist harassment, mediated the relationship between sexual minority status and depression in university students. However, in another university sample, Martin Storey and August (2016) found that the association between sexual minority status and depression was mediated by harassment due to gender nonconformity but not harassment due to sexual minority status. Furthermore, in two studies that controlled for additional factors, the role of victimisation as a mediator was reduced: Frisell, Lichtenstein, Rahman and Långström (2010) found that perceived victimisation and hate-crime victimisation attenuated the relationship between sexual orientation and depression. However, when controlling for familial confounding by comparing twins, depression differences between heterosexual and sexual minority participants were smaller, albeit still statistically significant for women. Similarly, Donahue, Långström, Lundström, Lichtenstein and Forsman (2017) found that the effect of sexual minority status on depressive symptomatology was largely attenuated when controlling for unmeasured familial confounding by comparing sexual minority youth to their heterosexual same sex twin siblings, and that adding general victimisation in the model had limited impact on the relationship.

### 3.11.2. Physical or sexual violence

Physical and sexual violence and abuse were investigated in some studies as general

experiences. Most, but not all, of the studies that examined such factors found them to be significant mediators. It is worth noting that these studies used questions that assessed experiences of violence and abuse without specifying whether participants thought that these experiences were due to their sexual orientation. Wong et al. (2015) found dating violence to be a mediator in the relationship between sexual orientation and depression in a sample of Chinese university students. McNair, Kavanagh, Agius and Tong (2005) also found history of abuse to be a significant mediator in women, albeit in a model that also encompassed stress and social support. McLaughlin, Hatzenbuehler, Xuan and Conron (2012) used an aggregate adversity measure that included physical and sexual abuse in childhood, housing adversity and intimate partner violence, and demonstrated that it mediated the relationship between sexual orientation and various mental health outcomes including depression. Hughes, Johnson, Steffen, Wilsnack and Everett (2014), who used a victimisation measure that included sexual and physical abuse as well as parental neglect prior to age 18, reported evidence for a mediational relationship only when comparing heterosexual to bisexual women as they found no depression differences between heterosexual and lesbian women. Similarly, Burns, Butterworth and Jorm (2016), who found that being bisexual but not gay/lesbian predicted depression, also showed that history of sexual trauma was one of the factors mediating the relationship between bisexual identity and depression. Finally, Szalacha, Hughes, McNair and Loxton (2017) found that identifying as lesbian or bisexual were not significant predictors of depression, but that identifying as mainly heterosexual was. The number of types of interpersonal violence was the strongest predictor of depression in their model, but was not found to mediate the relationship between mainly heterosexual identity and depression.

### 3.11.3. Stress-related factors

Findings regarding stress-related mediators were mixed. Frost and LeBlanc (2004) found evidence of mediation for non-event stress, in the form of barriers to core life pursuits. Safren and Heimberg (1999) reported that perceived stress, and specifically low number of positive events, predicted depression in youth, while adding sexual orientation in the model did not contribute to additional variance, despite finding sexual orientation to predict depression disparities when it was analysed as the sole predictor. McNair et al. (2005) found that perceived stress, along with other variables, explained the relationship between sexual minority status and depression in sexual minority young adult and mainly heterosexual middle age women. Similarly, Przedworski et al. (2015) demonstrated

evidence of mediation for social stress, in the form of discrimination and loneliness, in a sample of medical students. Furthermore, Teasdale and Bradley-Engen (2010) used a social stress measure that took into account experiencing and witnessing victimisation, perceptions of prejudice, experiencing sexual victimisation, desire to run away from home, and suicide of a close friend or family member and found that this composite measure decreased the association between sexual orientation and depressed mood. Ueno (2010) also found that both negative life events and chronic strains attenuated the relationship between same-sex contact and depression. However, Riley, Kirsch, Shapiro and Conley (2016) reported that stress did not meet the criteria for mediation in a sample of university students once baseline depression was controlled for.

Findings by Burns et al. (2016) suggested that physical health and health-related behaviours like smoking, as well as other stressors discussed earlier in this section, contributed to the relationship between bisexual identity and depression.

### 3.11.4. Interpersonal factors / support

A few studies looked at variables related to relationship with parents and parental support. Family support was found to attenuate the relationship between sexual contact and depression symptoms in one of the studies (Ueno, 2010). La Roi et al. (2016) found parental rejection to mediate the relationship between sexual minority status and depression outcomes for girls but not for boys. The findings of Pearson and Wilkinson (2013) were similar: In girls, perceived closeness with parents, parental involvement, and perceived family support seemed to mediate the relationship between same sex attraction and depressive symptoms, with perceived family support emerging as the most important factor underlying the association. For boys, family relationship variables seemed to explain less of the association than for girls. However, for boys too, closeness with parents seemed to mediate the relationship between same-sex attraction and depressive symptoms. Needham and Austin (2010) showed some evidence of mediation for parental support but only when comparing bisexual to heterosexual women, as other groups were not found to differ in depression rates. Rosario et al. (2014) found that less secure attachment attenuated the relationship between sexual orientation and depressive symptoms for all sexual minority groups when compared to heterosexuals.

Elements related to general social support were also found to mediate the relation between sexual minority status and mood outcomes. Teasdale and Bradley-Engen (2010)

demonstrated evidence of mediation for social support in a sample of adolescents. Evidence of mediation for social support was reported in studies of adolescents (Teasdale & Bradley-Engen, 2010) and in women who had experienced intimate partner violence (Miller & Irvin, 2016). Moreover, two other studies (McNair et al., 2005; Spencer & Patrick, 2009) found that social support, along with other mediators, attenuated the relationship between sexual minority identity and depressive symptoms. Hatzenbuehler, McLaughlin and Xuan (2012) found that social isolation mediated the relationship between same-sex attraction and depression in boys but this relationship was not found in girls. Burns et al. (2016) found that social support, along with other suggested mediators, explained the relationship between bisexual identity and depressive symptoms. Similarly, Sigurvinsdottir and Ullman (2017) found that perceived social support mediated the association between bisexual identity and depression in women survivors of sexual assault.

More systemic measures of social support were also explored as mediators. A sense of belonging in the community was found to attenuate the association between sexual orientation and dysphoria in samples of Australian women (McLaren, 2006) and men (McLaren, Jude, & McLachlan, 2007). Martin-Storey and Crosnoe (2012) found that sexual minority status and harassment due to sexual minority status were associated with depression outcomes via negative perceptions of school environment in an adolescent sample. Similarly, another study found some evidence of mediation for institutional betrayal leading up to or after a sexual assault in undergraduate students who had experienced sexual assault or harassment (Smith, Cunningham, & Freyd, 2016).

### 3.11.5. Intrapersonal factors

Some studies looked at intrapersonal psychological processes as potential mediators. Martin-Storey and Crosnoe (2012) found that self-concept (self-esteem and self-concept coherency) was one of the significant mediators in their model. Similarly, Ueno (2010) showed evidence that self-esteem, along with mastery and a sense of mattering, attenuated the association between same-sex contact and depressive symptoms. Consistent to Ueno, Spencer and Patrick (2009) also found that when personal mastery (along with social support) was entered in their model, sexual orientation no longer uniquely contributed to the variance of depressive symptomatology, suggesting that both personal mastery and social support were intermediate factors of the relationhsip. Lower emotional awareness and greater rumination were also found to mediate the relationship between sexual

orientation and depression in a group of middle school children (Hatzenbuehler et al., 2008). On the other hand, there was not enough evidence that other coping mechanisms, such as acceptance coping accounted for the relationship between sexual orientation and depressive symptoms in Safren and Heimberg's (1999) model. Similarly, Riley et al. (2006) reported that the coping styles of denial and blame partially mediated the relationship between sexual identity and depressive symptoms but this effect was no longer significant after controlling for baseline depression. Ueno (2010) reported that self-exploratory attitudes, including fun-seeking, number of sexual partners, and age of first sexual experience did not account for the relationship between same-sex contact and symptoms of depression. Finally, Wong et al. (2005) found that sexual orientation concealment was a significant mediator in a sample of Chinese university students.

# 4. Discussion

## 4.1. Summary of Findings and Implications

The aim of the present study was to review research evidence regarding psychosocial factors that may mediate the increased depression rates in sexual minority compared to heterosexual populations. Thirty-three studies were identified and reviewed. Findings suggest that victimisation, harassment, and discrimination experiences may be routes through which the disparities in depression symptomatology arise, especially for adolescents and young adults. History of physical and sexual violence has also been found to mediate differing depression rates in some studies. Many studies suggest different types of stress as mediators, including social stress, increased rate of adversity and negative life events, as well as barriers to valued life pursuits and low numbers of positive life events. One study found that physical health disparities attenuated the relationship between sexual identity and depression. Regarding interpersonal factors, studies indicate that LGB individuals experience to a lesser degree the protective effects of social support and other systemic factors (e.g. quality of the environment, sense of belonging) and that these may help explain increased depression rates. Studies that examined family relationships as mediators have demonstrated that parental relationships may also partly explain depression disparities, with the suggestion that this mechanism may be strongly for girls than for boys. Sexual orientation concealment was a significant mediator in the one study that investigated this factor. A few studies also looked at intrapersonal psychological factors such as mastery, self-esteem, coping styles, and emotion regulation.

These factors have been shown to mediate the relationship between sexual orientation and depression, with some mixed results with regards to coping styles.

These findings are largely consistent with minority stress theory, according to which disproportionate stress related to stigma and discrimination results in elevated rates of psychological distress (Meyer, 2003). Most studies in this review, report evidence that supports the suggestion that sexual minority individuals experience more stressors such as harassment, victimisation, violence, abuse, parental rejection, and other forms of adversity, and receive less social support and access to valued positive experiences than their heterosexual counterparts. Furthermore, dealing with issues of disclosure and concealment can impact on their sense of self, sense of mastery, identity, and belonging, putting a strain on their capacity to cope. Findings were also consistent with Hatzenbuehler's (2009) suggestion that increased exposure to stressors may impact the social, regulatory, and cognitive factors that have been found to be predictive of depression, such as low social support, increased rumination, low emotion regulation, poor sense of mastery, and low self-esteem. According to the literature reviewed here, all these factors may help explain the increased rates of depression in sexual minority individuals.

Three of the studies reviewed controlled for familial confounding when examining victimisation (Donahue et al., 2017; Frisell et al., 2010) and maternal attachment (Rosario et al., 2014) as mediators. The first two studies found that the mediation relationships were weaker or disappeared when comparing among twin siblings. This led the researchers to suggest that shared genetic or environmental influences may play an important role in explaining depression disparities, without ruling out the possibility that minority stressors affecting heterosexual siblings may help explain their findings. In contrast, Rosario et al. (2014) found that the attachment was still a mediator after controlling for sibling clustering. These findings along with other research (Zietsch et al., 2012) investigating shared etiological factors, may indicate that genetic and/or environmental familial factors not directly related to sexual minority identification contribute to increased depressive symptoms in sexual minority individuals. It has also been argued that minority stressors and stigma may affect other members of the family (Donahue et al., 2017; Timmins, Rimes, & Rahman, 2017) which may help explain these findings.

### 4.2. Limitations of Studies

The methodological quality of studies varied, with a bit less than a quarter of the studies suffering from important methodological limitations. Many studies had significant response and attrition issues. Furthermore, only one study used diagnostic interview questions to assess the presence or absence of clinical depression, rather than relying on self-report measures of depressive symptoms or the presence of a depression diagnosis. Moreover, many studies used measures for their mediators for which there was inadequate evidence of validity and/or reliability.

Another serious methodological issue was that the majority of the reviewed studies were cross sectional. A cross-sectional design does not allow the examination of causal pathways and therefore conclusions cannot be drawn about the predictive value of the independent variable and the mediators. For example, one might argue for reverse causality, arguing that, for instance, depression may lead to isolation and decreased social support. Furthermore, many studies used retrospective self-reports to assess mediators such as victimisation, abuse, and social support. When retrospective self-reports are used, recall biases may inflate the associations demonstrated. This is especially the case if mediation measures are collected at the same time with measures of depression, as the mood-congruent memory bias observed in depression (e.g. Watkins, Vache, Verney, Muller, & Matthews, 1996) could affect the way individuals report their past experiences.

Another complication related to temporality was that a few cross-sectional studies used history of experiences such as victimisation without specifying a specific time frame. Such experiences might have therefore occurred before participants identified as sexual minority (e.g. in childhood). This violates mediation theory in that the independent variable would not necessarily precede the mediator in time. It is hence debatable whether these studies can claim that they provide evidence for mediation.

While some of the studies measured variables of interest in a longitudinal fashion, none of them used data from several different waves of measurement; they either measured sexual orientation and mediator at time 1 and depression at time 2, or sexual orientation at time 1 and mediator and depression at time 2. In addition, some of the longitudinal studies did not control for baseline depression levels and none of the studies controlled for baseline measures of the mediator. Controlling for baseline scores is important as it

generally explains a great deal of the variance in later measures, thus improving precision and power to detect effects of the mediator on the outcome.

Many of the studies had significant limitations in the statistical approaches they used to examine mediation. Firstly, many of the studies used the Causal Steps approach (Baron & Kenny, 1986) without then calculating an indirect/mediated effect or conducting a statistical test for this effect. This means that while papers presented evidence of mediated effects, these effects were often not properly evaluated from a statistical standpoint. Secondly, the quality of reporting of statistics and data analytic techniques was variable. Although many studies had large samples, very few studies provided a justification for sample size selected or reported their power analysis. Moreover, many studies did not report exactly what statistical tests they used and others failed to follow good practices in reporting mediation analysis results such as presenting confidence intervals of direct and indirect paths. Thirdly, one study (McNair et al., 2005) did not report estimates for individual mediators which makes interpretations about their unique contribution very difficult.

Over a third of the studies included in this review used large cohort samples. However, many of the studies used subsamples of the population or other samples that limit the generalisability of the results presented. There was a lot of variability in how sexual minority was defined and categorised, as well as to how depression was measured. Furthermore, most studies did not investigate differences across sexual minority subgroups due to issues with sample size and power, with some studies ignoring or excluding some groups from their analysis. Further research can aim to develop a better understanding of the distinct issues and outcomes that different sexual minority groups face. For example, there is some evidence to suggest that bisexuals may have especially high risk for mental health problems (Burns et al., 2009; Hughes et al., 2014; Needham & Austin, 2010). Groups identifying as *mostly heterosexual* are also poorly understood with some studies reporting similar or worse outcomes for them compared to other sexual minority groups (Corliss, Austin, Roberts, & Molnar, 2009; McNair et al., 2005; Rosario et al., 2014; Szalacha et al., 2017).

The overwhelming majority of studies reviewed took place in specific locations within the US. Research findings will be affected by the policy and societal climate of the time and place in which the studies were conducted. Sexual minority stressors are likely to

vary significantly across countries as well as within countries in different sections of the population. Therefore, these findings cannot be generalised to the international community or to sections of the population that were not examined in the studies included in this review.

### 4.3. Limitations of the Review Process

This review did not include grey literature and research that was not published in peer-reviewed journals. As a consequence, it is possible that the well-documented bias of reporting and publishing mostly positive results in scientific journals can affect the conclusions. Although this review did present a few negative findings, it is still likely that a publication bias conceals research findings about factors that do not mediate the differing depression rates among sexual minority and heterosexual individuals. Moreover, this review did not include research that was not published in languages other than English which may have restricted the inclusion of studies that took place in different parts of the world and can therefore limit the generalisability of the results as discussed above.

Finally, this review only included studies that used a mediation framework and it should be noted that the use of mediation frameworks in this context is not without limitations. Even in longitudinal designs, without experimental manipulation or randomization, there will likely be unmeasured confounders that covary with the mediator and outcome, leading to biased estimates of the mediation model. Furthermore, it is very difficult, using observational data, to confirm whether a hypothesised casual structure is indeed correct. For instance, the choice to include a variable as a mediator as opposed to a moderator may sometimes be subject to debate in this context, and observational data alone cannot clarify which approach is superior. Moreover, although longitudinal observational studies do recognise that mediation processes need to unfold over time, they often make assumptions with regard to the timing of the effect of the predictor on the mediator and of the mediator on the predictor. Ideally, multiple measures of all the variables should be collected such that the nature of how the process unfolds could be better modeled, particularly when the timings of the effects are unknown (Peal & Hoyle, 2017).

### 4.4. Conclusions and Directions for Future Research

This review found evidence consistent with suggestions that stressors such as victimisation, harassment, abuse, life stress, and limited social and familial support

contribute to the increased depression rates found in sexual minority individuals compared to heterosexuals. There was also some evidence suggesting that differences in psychological processes such as self-esteem, mastery, emotion regulation, rumination and coping styles may also play a role.

Prospective studies are required in which sexual orientation, mediators, and depression outcomes are assessed at at least three consecutive time points. Furthermore, appropriate statistical methods should be used to examine mediation processes. Studies using structured assessment of clinical depression are required to overcome some of the limitations associated with self-report of depressive symptomatology.

Further research is needed to better understand possible psychological mechanisms through which minority stressors exert their impact on mental health. Research could also explore whether and how shared genetic or environmental factors relate to the elevated depression risk of sexual minorities, independently from minority stressors. Different aspects of sexuality such as attraction, identity, and behaviour should be studied in order to better understand their association with different risk factors and outcomes. Some studies in this review reported distinct findings for males and females but more research into gender differences is required. Finally, further information on how the present findings translate to other populations and cultures and across sexual minority subgroups including bisexual and mostly heterosexual individuals would be useful.

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APPENDIX A – QUALITY ASSESSMENT

| | 1. Theory | 2. Predictor | 3. Mediator | 4. Outcome | 5. Power | 6. Analysis | 7. Mediator before outcome | 8. Predictor before mediator | 9. Confoun-nders | 10. Recru-itment | 11. Represen-tativeness | 12. Response Uptake | **Quality rating** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Almeida et al. (2009)** | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | **Fair** |
| **2. Burns et al. (2016)** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | **Fair** |
| **3. Burton et al. (2013)** | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | **Good** |
| **4. Donahue et al. (2017)** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | **Poor** |
| **5. Frisell et al. (2010)** | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **Poor** |
| **6. Frost & LeBlanc (2014)** | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | **Fair** |
| **7. Hatzenbuehler et al. (2008)** | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | **Fair** |
| **8. Hatzenbuehler et al. (2012)** | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **9. Hughes et al. (2014)** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **Poor** |
| **10. la Roi et al. (2016)** | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | **Good** |
| **11. Martin-Storey & August (2016)** | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | **Fair** |
| **12. Martin-Storey & Crosnoe (2012)** | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **13. McLaren (2006)** | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **Fair** |
| **14. McLaren et al. (2007)** | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | **Fair** |

| | 1. Theory | 2. Predictor | 3. Mediator | 4. Outcome | 5. Power | 6. Analysis | 7. Mediator before outcome | 8. Predictor before mediator | 9. Confoun-nders | 10. Recru-itment | 11. Represen-tativeness | 12. Response Uptake | **Quality rating** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15. McLaughlin et al. (2012)** | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **16. McNair et al. (2005)** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **17. Miller & Irvin (2016)** | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | **Poor** |
| **18. Needham & Austin (2010)** | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **19. Pakula et al. (2016)** | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **20. Pearson & Wilkinson (2013)** | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | **Good** |
| **21. Przedworski et al. (2015)** | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | **Fair** |
| **22. Riley et al. (2016)** | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | **Fair** |
| **23. Robinson et al. (2013)** | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **24. Rosario et al. (2014)** | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | **Fair** |
| **25. Safren & Heimberg (1999)** | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **Poor** |
| **26. Sigurvinsdottir & Ullman (2017)** | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | **Fair** |
| **27. Smith et al. (2016)** | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **Poor** |
| **28. Spencer & Patrick (2009)** | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | **Fair** |

| | 1. Theory | 2. Predictor | 3. Mediator | 4. Outcome | 5. Power | 6. Analysis | 7. Mediator before outcome | 8. Predictor before mediator | 9. Confoun-nders | 10. Recru-itment | 11. Represen-tativeness | 12. Response Uptake | **Quality rating** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **29. Szalacha et al. (2017)** | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **30. Teasdale & Bradley-Engen (2010)** | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | **Fair** |
| **31. Ueno (2010)** | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **Poor** |
| **32. Wong et al. (2017)** | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | **Fair** |
| **33. Woodford et al. (2015)** | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | **Fair** |

APPENDIX B – STUDY CHARACTERISTICS

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| **1. Almeida et al. (2009)** | Cross sectional | *n* = 1,032<br>103 LGB, 929 non LGB | Public high schools<br>Boston, USA | **Age:** 13-19 years (*M* = 16.3, *SD* = 1.3)<br>**Gender:** 58.3% females, 41.7% males<br>**Ethnicity**: 30.7% Hispanic, 44.8% non-Hispanic Black, 10.8% Asian / Pacific Islander / Biracial/ Multiracial / Other |
| **2. Burns et al. (2016)** | Longitudinal | *n* = 4824<br>149 LGB, 4675 non LGB | Community sample<br>Australia | **Age:** 48.5% of the sample were between 20-24 years, 51.5% of the sample were 40-44 years<br>**Gender:** 47.9% females, 52.1% males |
| **3. Burton et al. (2013)** | Longitudinal | *n* = 197<br>55 LGB, 137 non LGB | Adolescent medicine clinics<br>Pennsylvania and Ohio, USA | **Age:** 14-19 years (*M* = 17, *SD* = 1.36)<br>**Gender**: 70% females, 20% males<br>**Ethnicity**: 31% White, 63% African American, 3% Other |
| **4. Donahue et al. (2017)** | Cross sectional | *n* = 3987<br>331 LGB, 3656 non LGB | Population-based sample of twins<br>Sweden | **Age**: 18 years<br>**Gender**: 59.3% females, 40.7% males |
| **5. Frisell et al. (2010)** | Cross-sectional | *n* = 16,728<br>1241 had same-sex partners, 15487 did not have same-sex partners | Population-based sample of twins<br>Sweden | **Age:** 20 to 47 years (*M* = 33.7)<br>**Gender:** 39.8% females, 60.2 males<br>**Education:** 4.4% Low, 47.3% Medium, 45.7% High, 2.6% Missing<br>**Currently in relationship:** 73.5% Yes, 25.3% No, 1.2% Missing |
| **6. Frost & LeBlanc (2014)** | Cross sectional | *n* = 431<br>239 LGB, 192 non LGB | Online study<br>USA and Canada | **Age**: *M* = 31.71 years (*SD* = 10.75)<br>**Gender**: 69.4% females, 30.6% males<br>**Ethnicity:** 71% White, 14% Black, 6% Latino, 6% Asian, 2% Native American, 1% Pacific Islander, 7% other<br>**Education:** 57% some college or more, 43% high school diploma or less<br>**Employment:** 52 full-time, 20 part-time, 14 unemployed, 36 student<br>**Relationship status:** 43% single, 57% in a relationship |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| **7. Hatzenbuehler et al. (2008)** | Longitudinal | *n* = 1071<br>29 LGB, 1042 non LGB | Middle schools<br>Connecticut, USA | **Age:** 11-14 years<br>**Grades:** 31.8% in sixth grade, 33.9% in seventh grade, 34.3% in eighth grade<br>**Gender:** 48.8% females, 51.2% males<br>**Ethnicity**: 13.2% non- Hispanic White, 11.8% non-Hispanic Black, 56.9% Hispanic, 2.2% Asian/Pacific Islander, 0.2% Native American, 0.8% Middle Eastern, 9.3% Biracial or Multiracial, 4.2% members of other racial/ethnic groups, 1.3% unspecified racial/ethnic background<br>**Household:** 27.4% lived in single-parent households |
| **8. Hatzenbuehler et al. (2012)** | Cross-sectional | *n* = 14,319<br>151 LG, 708 BI, 13,353 non LGB | Data from nationally representative sample of adolescents, USA | **Age:** 12-18 years (Grades 7 to 12)<br>**Gender:** 51% females, 49% males |
| **9. Hughes et al. (2014)** | Cross sectional | *n* = 1573<br>326 L, 124 ML, 27 BI 72 MH, 1573 non LGB | Data from women participating in two large studies (national & Chicago Metropolitan area), USA | **Age:** *M* = 45.18 years (*SE* = 1.21)<br>**Ethnicity:** 65.3% non-Hispanic White, 20% non-Hispanic Black, 11.6% Hispanic, 3.1% Other<br>**Education:** 37% high school or less, 31.9% some college, 16.8% college degree, 14.2% graduate/professional degree<br>**Residence:** 59.9% Urban, 15.7% Rural, 24.4% Chicago metropolitan |
| **10. la Roi et al. (2016)** | Longitudinal | *n* = 1738<br>151 LGB, 1587 non LGB | Data from large cohort study of Dutch adolescents.<br>Five municipalities in the north of Netherlands (urban & rural) | **Age**: Wave 1: *M* = 11.1; Wave 2: *M* = 13.6; Wave 3: *M* = 16.3; Wave 4: *M* = 19.1; Wave 5: *M* = 22.3<br>**Gender:** 54.8% females, 45.2% males |
| **11. Martin-Storey & August (2016)** | Cross sectional | *n* = 251<br>93 LGB, 158 non LGB | University and college students<br>Southwestern city, USA | **Age:** non LGB *M* = 20.3 years (*SD* = 1.5), LGB *M* = 20.29 years (*SD* = 1.4)<br>**Gender:** 58% females, 42% males<br>**Ethnicity:** 19.5% Asian, 4.4% Black/ African American, 61% White, 10% Hispanic, 5% unspecified<br>**Family-of-origin income:** Incomes were distributed over the range presented, with 7.2% of the sample having families with incomes of |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| | | | | $20,000 yearly or less.<br>**Residence**: 36% grew up in a city, 53% in a suburb, 11% in a rural area<br>**Education**: 91% attended a university, 9% attended a community college |
| **12. Martin-Storey & Crosnoe (2012)** | Cross sectional | *n* = 957<br>40 LGB, 917 non LGB | Data from a four-phase, multi-site, prospective study<br>USA | **Age:** 15 years<br>**Gender:** 50.9% females, 49.1% males<br>**Ethnicity:** 81% white, 12% African American, 1% Asian or Pacific islander, 5% Other<br>**Family structure:** 63% had father present at home |
| **13. McLaren (2006)** | Cross sectional | *n* = 386<br>184 L, 202 non LGB | Community sample of women<br>Victoria, Australia (urban, rural, regional areas) | **Relationship status**: 55% heterosexuals / 57% lesbians were married or in a committed relationship.<br>**Education:** 48% of heterosexual women and 29% of lesbians had completed secondary school; 25% of the heterosexual women and 47% of the lesbians had completed a university degree |
| **14. McLaren et al. (2007)** | Cross sectional | *n* = 273<br>137 G, 136 non LGB | Community sample of men, Australia | **Age:** *M* = 39.02<br>**Relationship status:** 41% gay men / 23% heterosexual men were single, 48% gay men / 68% heterosexual men were married or in a committed relationship, 10% gay men/ 9% heterosexual men were separated or divorced, and 1% of gay men / 0% of heterosexual men were widowed<br>**Education:** 64% gay men / 51% heterosexual men had a university degree<br>**Residence**: 73% gay men / 63% heterosexual men leaved in an urban setting; 27% gay men / 37% heterosexual men leaved in a rural setting<br>**Income:** heterosexual men had a higher average income than gay men |
| **15. McLaughlin et al. (2012)** | Cross sectional | *n* = 13,962<br>227 LG, 245 BI, 13,490 non LGB | Data from national cohort study of adolescents/ young adults<br>USA | **Age:** 18-27 years<br>**Gender:** 47% females, 53% males<br>**Ethnicity**: 66% non-Hispanic white, 16% non-Hispanic black, 12% Hispanic, 7% other<br>**Education:** 52% enrolled or completed college, 48% no college |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| **16. McNair et al. (2005)** | Cross sectional | *n* = 19,559<br>Younger cohort: *n* = 9260<br>92 L, 75 BI, 634 MH, 8,482 non LB<br>Mid-age cohort: *n* =10299<br>126 L, 16 BI, 122 MH, 10,035 non LB | Data from large national sample of women, Australia | Two subsamples included: Younger cohort / Older cohort<br>**Age**: 22-27 (younger cohort), 50-55 years (mid-age cohort)<br>**Residence:** random sampling from Australian population register; oversampling from rural and remote areas |
| **17. Miller & Irvin (2016)** | Cross sectional | *n* = 4769<br>95 LGB, 4674 non LGB | Data from a nationally-representative sample of intimate partner violence survivors<br>USA | **Age**: *M* = 46.6<br>**Gender**: 78% females, 22% males<br>**Ethnicity**: 71% White; 11% Black; 3% Hawaiian/Asian; 2% Native American; 4% Hispanic; 8% Multiracial; 1% Other<br>**Income**: 26% low; 40% medium; 15% medium high; 19% high<br>**Education**: 9% less than high school; 28% high school graduate; 32% some college; 30% college graduate |
| **18. Needham & Austin (2010)** | Cross sectional (baseline data used as confounder) | *n* = 11,195<br>193 LG, 192 BI, 10,768 non LGB | Data from a nationally representative sample of adolescents and young adults, USA | **Age:** 18-26 years at wave 3, *M* = 21.8 years<br>**Gender:** 51% females, 49% males |
| **19. Pakula et al. (2016)** | Cross sectional | *n* = 222,548<br>2893 LG, 2225 BI, 217,652 non LGB | Data from a large, national, multi-year sample<br>Canada | **Age:** 27.5% 18-29 years, 22.5% 30-39 years, 25.7% 40-49 years, 24.4% 50-59 years<br>**Gender:** 50.1% females, 49.9% males<br>**Education**: 9.3% less than secondary school, 17.6% secondary school, 8.7% some post-secondary education, 64.3% post-secondary education<br>**Racialized minority:** 21.9% yes, 78.1% no<br>**Marital status:** 37.4% single/ widowed/ divorced, 62.6% married / common law<br>**Residence:** 17% rural; 83% urban |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| **20. Pearson & Wilkinson (2013)** | Longitudinal | *n* = 11,601<br>770 LGB, 10,831 non LGB | Data from nationally representative sample of adolescents<br>USA | **Age:** 12-18 years (Grades 7 to 12) *M* = 15.63 years<br>**Gender:** 51.9% females, and 48.1% males<br>**Ethnicity:** ~ 66% Non-Latino White, 15% Black, 11% Latino, 3% Asian/Pacific Islander, 3% Other |
| **21. Przedworski et al. (2015)** | Cross sectional | *n* = 4673<br>232 LGB, 4441 non LGB | Data from national study of medical students<br>USA | **Age**: *M* = 23.8 years<br>**Gender**: 50% females, 50% males<br>**Ethnicity:** 6.5% Black, 6% Hispanic, 14% east Asian, 10% south Asian, 63% white<br>**Relationship status**: 46% not in a relationship, 37% in a non-cohabitating relationship, 3% engaged, 14% married or living together |
| **22. Riley et al. (2016)** | Longitudinal | *n* = 1777<br>75 LGB, 1702 non LGB | First year university students<br>USA | **Age:** LGB *M* = 18.38 years, non LGB *M* = 18.49 years<br>**Gender**: 70.1% females, 29.9% males<br>**Ethnicity**: LGB sample: 1.4% American Indian/Alaskan, 9.6% Asian, 2.7% Black/African-American, 11.0% Hispanic/Latino, 2.7% Other, 1.4% Puerto Rican, 71.2% White<br>Non LGB sample: 0.5% American Indian/Alaskan, 11.6% Asian, 2.4% Black/African-American, 7.2% Hispanic/Latino, .5% Multi-racial, .4% Native Hawaiian / Other, 2.8% Other, 1.5% Puerto Rican, 72.1%White |
| **23. Robinson et al. (2013)** | Longitudinal | *n* = 4135<br>187 LGB, 3948 non LGB | Data from a longitudinal study of young people<br>UK | **Age:** 13-14 to 19-20 years<br>**Gender:** 50.4% females, 39.6% males<br>**Ethnicity:** Only 'White British' sample was used |
| **24. Rosario et al. (2014)** | Longitudinal Sibling-comparison design | *n* = 6122<br>101, 101 BI, 611 MH, 5309 non LGB | Data from a longitudinal cohort study of early adolescent children,<br>USA | **Age:** 17-25 years (*M* = 20.6, *SD* =1.7)<br>**Gender:** 64.4% females, 35.6% males<br>**Ethnicity:** 93.9% White |
| **25. Safren & Heimberg (1999)** | Cross sectional | *n* = 104<br>56 LGB, 48 non LGB | Community sample of youth Philadelphia,<br>USA | **Age**: 16-21 years, *M* = 18.2<br>**Gender**: 51.9% females, 48.1% males<br>**Ethnicity:** LGB sample: 48% African American, 2% Asian, 9% Hispanic, 32% White, 9% Biracial, 2% Arabic<br>Non LGB sample: 58% African American, 40% White, 2% Biracial<br>**Education level**: LGB sample *M* = 12.1 (*SD* = 1.5); non LGB sample |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| | | | | *M* = 12.4 (*SD* = 1.9)<br>**Living situation:** LGB sample: 57% with parents; 16% with roommates; 11% other adult relative; 5% with grandparents; 5% with siblings; 4% on their own; 2% group or residential<br>Non LGB sample: 50% with parents; 10% with roommates; 11% other adult relative; 2% with grandparents; 6% with siblings; 2% in foster care; 2% group or residential |
| **26. Sigurvinsdottir & Ullman (2017)** | Longitudinal | *n* = 905<br>95 BI, 810 non LGB | Community sample of bisexual and heterosexual sexual assault women survivors Chicago metropolitan area, USA | **Age:** 18-71 years, *M* = 45.05 years<br>**Ethnicity**: Heterosexual women: 48% African American, 36% White, 2% Asian, 7.90% Other, 13.10% Hispanic, 5.9% Multiracial.<br>Bisexual women: 36.8% African American, 41.1% White, 2.1% Asian, 10.6% Other, 13.1% Hispanic, 9.5% Multiracial<br>**Employment:** 43.40% of heterosexual women and 37.9% of bisexual women were employed<br>**Education:** Heterosexual women: 33.8% college degree or higher, 43.4% some college, 13.9% high school graduate, 8.9% not completed high school.<br>Bisexual women: 26.3% college degree or higher, 37.9% some college, 23.2% high school graduate, 12.6% not completed high school<br>**Income:** Heterosexual women: 38.1% $10,000 or less, 19% $10,000-20,000; 12.1% $20,000-30,000, 30.8% £30,000 or more.<br>Bisexual women: 47.3% $10,000 or less; 22.6% $10,000-20,000; 9.7% $20,000-30,000; 20.5% £30,000 or more |
| **27. Smith et al. (2016)** | Cross sectional | *n* = 299<br>29 LGB, 270 non LGB | Undergraduate psychology students in a large public university Pacific Northwest, USA | **Age:** 19 - 25 years<br>**Gender:** 59.9% females, 39.8% males, 0.3% transgender-identified<br>**Ethnicity**: 69% Caucasian, 11.2% Asian American/Pacific Islander, 7.7% Latino, 5.2% Black/African American, 6.9% Other |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| **28. Spencer & Patrick (2009)** | Cross-sectional | *n* = 306<br>66 LG, 24 BI | Online convenience sample of young adults<br>USA | **Age:** Mean 21.34<br>**Gender:** 69.6% females, 30.4% males<br>**Ethnicity:** 88.2% Non-Hispanic white, 11.8% Other<br>**Living arrangement:** 9.5% alone, 12.4% with a domestic partner, 40.5% with non-relatives, 37.9% with relatives/other<br>**Residence:** 54.6% Rural, 45.4% Urban<br>**Relationship status:** 55.2% in a committed relationship, 45.1% other<br>**Religion:** 24.2% Protestant, 28.1% Catholic, 26.1% Jewish or other, 21.2% none<br>**Employment:** 85.9% college/university student; 14.4% employed/other |
| **29. Szalacha et al. (2017)** | Cross-sectional | *n* = 8850<br>568 MH, 100 BI, 99 L, 8083 non LB | Data drawn from national study of women<br>Australia | **Age:** 25-30 years<br>**Education:** 10% Year 10 or less; 19.2% Year 12 or equivalent; 26.6% Trade/Diploma; 34.2% University diploma; Postgraduate degree 10.6%<br>**Income (AUD):** 2% 15,999 or less; 4.9% 16,000-36,999; 11.6% 37,000-51,999; 81.1% 52,000 or greater<br>**Relationship Status:** 34.7% Single; 41.6% Married; 20.4% De facto; 2.7% Separated / Divorced<br>**Parental Status:** 68% no children; 32% 1 or more children<br>**Residence:** 60.5% Urban; 39.5 Rural |
| **30. Teasdale & Bradley-Engen (2010)** | Longitudinal | *n* = 11,243<br>787 LGB, 10456 non LGB | Data from a large national sample of adolescents<br>USA | **Age:** Average age = ~16 years<br>**Gender:** 52% females, 48% males<br>**Race/ethnicity:** 42% White, 20% African Americans, 24% Hispanic, 14% other origins (including Asian, Native American and other)<br>**Location:** 54% attended schools in suburban communities, 29% in urban communities, 17% in rural communities |
| **31. Ueno (2010)** | Cross-sectional | *n* = 1492<br>64 had same-sex contact, 1428 did not have same-sex contact | Community sample of young adults<br>Miami-Dade, USA | **Age:** 18-23 years (*M* = 20.02)<br>**Gender:** 46% females, 54% males<br>**Ethnicity:** 27.2% Non-Hispanic White; 23.8 African American; 24.8% Cuban; 23.7% Other Hispanic; 0.1% Other race<br>**Education:** 80.4% graduated from high school |

| STUDY | DESIGN | SAMPLE | SETTING / COUNTRY | SAMPLE CHARACTERISTICS |
|---|---|---|---|---|
| **32. Wong et al. (2017)** | Cross sectional | *n* = 1076<br>142 LGB, 934 non LGB | Multi-site university sample<br>China | **Age:** *M* = 20.9 years (SD = 3.7)<br>**Gender:** 57.6% females, 39.3% males<br>**Education:** 0.5% primary or below, 5.9% secondary, 91.8% tertiary or above. 93.7% of participants were university students<br>**Dating status:** 73% dating, 3% cohabitating, 6.6% broke up in the past month, 16.3% broke up in the past year |
| **33. Woodford et al. (2015)** | Cross sectional | *n* = 2428<br>426 LGB, 2002 non LGB | University students<br>Midwest, USA | **Age:** *M* = 23.1 years<br>**Gender:** 61.2% females, 38.8% males<br>**Ethnicity**: 72% White |

APPENDIX C - MEDIATORS

| | STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|---|
| 1. | **Almeida et al. (2009)** | • Perceived discrimination | Yes or No item: "sometimes people feel they are discriminated against or treated badly by other people. In the past 12 months, have you felt discriminated against because someone thought you were gay, lesbian, or bisexual?". |
| 2. | **Burns et al. (2016)** | • Social support<br>• Health and behaviours<br>• Behavioural activation and inhibition | • Major life events: age first moved away from the parental home; age first moved in with first partner; age of first sex; measure of traumatic life events (whether a respondent had ever been sexually molested or raped).<br>• Social support: estimated from a factor analysis of the *Schuster Social Support Scale* (Schuster, Kessler, & Aseltine, 1990) assessing family, partner and friend negative/positive support. Two factors extracted reflecting positive and negative support.<br>• Physical health: continuous Short Form-12 Physical Health Component Score that was computed following the RAND scoring (Hays, Sherbourne, & Mazel, 1993), and a binary indicator for Self-Rated Health. Health behaviours were adjusted using indicators of smoking status and alcohol consumption.<br>• Personality: *BIS–BAS*, a measure of behavioural activation and inhibition, with total scores for separate BAS and BIS (Carver & White, 1994). |
| 3. | **Burton et al. (2013)** | • Sexual minority specific victimisation | Victimisation due to actual or perceived sexual minority status: measured at waves 1 and 2 by four items that assessed the frequency of being teased/bullied, hit/beaten up, treated unfairly, or called bad names because someone thought the participant was gay/lesbian, during the past six months (waves 1 and 2: $\alpha = .86$). |
| 4. | **Donahue et al. (2017)** | • Victimisation | Participants reported whether they had experienced emotional abuse, physical abuse/neglect, sexual abuse, or sexual assault. A dichotomous variable was created indicating history of any type of victimisation experience. |
| 5. | **Frisell et al. (2010)** | • Perceived victimisation<br>• Hate crime victimisation | • Perceived discrimination: self-report of ever having been 'discriminated against in an insulting or disparaging way'.<br>• Hate crime victimisation: single item asking whether respondents have 'experienced violence directed at him/her' because of 'race, ethnicity, gender, sexual orientation, or religion'. |

| | STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|---|
| 6. | **Frost & LeBlanc (2014)** | • Nonevent stress | Nonevent stress was assessed in the form of perceived barriers to participants' pursuit and achievement of personal projects. Barriers to project pursuit were measured with the *Personal Project Inventory* (PPI; Little, 1983). Participants were asked to list seven "things they are currently working on or plan to do in the near future" and provide a short description of each. Personal projects could be related to all aspects of life (e.g. career, academic, interpersonal relationships, family) and participants were instructed to include at least one career and at least one romantic relationship project. They rated each of their projects on a scale assessing how much they perceived barriers to pursuing these goals. This was done for a range of sources of barriers, with the analysis focusing on interpersonal barriers, where they separately rated the degree to which they perceived barriers in their pursuit of each personal project from four groups of people in their lives: (a) family, (b) friends, (c) coworkers, (d) "other people;" as well as on macrosocial barriers, where they separately rated the degree to which they perceived barriers as stemming from (e) their neighborhood and community, (f) laws and policies (α = .58 to .90). |
| 7. | **Hatzenbuehler, et al. (2008)** | • Emotional regulation: emotional awareness & rumination | The emotional awareness subscale of the *Emotion Expression Scale for Children* (Penza-Clyve & Zeman, 2002) assesses extrinsic processes of emotion regulation. The EESC demonstrated good reliability in the sample as a whole (α = .88), as well as within heterosexual (α = .87) and sexual minority (α = .91) subgroups.<br>The *Children's Response Styles Questionnaire* (CRSQ, Nolen-Hoeksema & Morrow, 1991) assesses children's responses to depressed mood. The study focused on the rumination subscale, which assesses the extent to which children respond to sad feelings with rumination. The CRSQ demonstrated good reliability in the sample as a whole (α = .86), as well as within both of the sexual orientation groups: heterosexual (α = .86) and sexual minority (α = .81). |
| 8. | **Hatzenbuehler, et al. (2012)** | • Social networks<br>• Social isolation<br>• Degree of connectedness<br>• Social status | Participants were asked to name their 5 best male and 5 best female friends. These nominations were used to create social network variables that captured the size and structure of peer networks. Three indicators were explored:<br>• Social isolation: two measures of social isolation were calculated: (a) in-degree (number of students in the school who nominated the participant); (b) out-degree (number of students in the school that were nominated by the participant).<br>• Degree of connectedness: The total number of students the participant could reach in three steps in the participant's network. This provides an index of how close or connected the respondent is to other peers in their social network.<br>• Social status: the participant's centrality within the peer network. Bonacich's centrality measure was used to capture social status within the peer network. Centrality is calculated based on a function of how many connections one has, and how well-connected one's peers are to other members of the social network (Bonacich, 1987). |

| | STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|---|
| 9. | **Hughes et al. (2014)** | • Victimisation | Three forms of victimisation experienced prior to 18 were assessed: sexual abuse, physical abuse, and parental neglect. Childhood sexual abuse was assessed using questions about eight types of sexual activities before age 18. Childhood physical abuse was measured with two questions. Parental neglect was also assessed using a one-item measure. Three forms of adult victimisation were assessed: adult sexual assault, adult physical assault, and intimate partner violence. Adult sexual assault and adult physical assault were measured with a single item for each. Items assessing intimate partner violence were used to assess violence and being threatened, and an open-ended question pertaining to physical aggression in a close romantic relationship. A measure of cumulative victimisation that summed the number of types of victimisation experienced across the lifespan was created. Dummy variables were created to indicate when in the life course the victimisation occurred: childhood victimisation only, adult victimisation only, revictimisation and neither childhood nor adult victimisation. |
| 10. | **la Roi, et al. (2016)** | • Peer victimisation<br>• Parental rejection | • Peer victimisation: measured at wave 1, using an item on bullying. Relational victimisation was measured using three items completed by teachers about victimisation and relational aggression by classmates at wave 2. A scale score was computed using the mean of three items (α = .85).<br>• Parental rejection: measured at waves 1 and 4, using self-reported parental rejection from the *EMBU-C* (Markus, Lindhout, Boer, Hoogendijk, & Arrindell, 2003). Respondents answered 4 questions on the extent to which they felt rejected by their father and/or mother. The internal consistency of the scale was good at wave 1 (α = .84 for rejection by the father; α = 84 for rejection by the mother) and moderate at wave 4 (α = .70 for rejection by the father; α = 67 for rejection by the mother). |
| 11. | **Martin-Storey & August (2016)** | • Harassment due to gender nonconformity<br>• Harassment due to sexual minority status | • Harassment perceived as occurring due to gender nonconformity: items were selected from a larger list derived from the victimisation literature and piloted with a convenience sample of sexual minority and heterosexual young adults. The questions were prefaced by the statement: "Some people experience harassment because other people think that the way they act or dress does not match the sex they were assigned at birth, or their gender nonconformity. The following questions ask if you've ever had any of these experiences due to your gender nonconformity". Participants responded the frequency with which they had experienced these events (α = .84).<br>• Harassment perceived as occurring due to sexual minority status: contained the same items as the scale assessing harassment due to gender nonconformity. This measure was also piloted with the group of seven individuals described previously. Participants were asked: "Some people face harassment because of their actual sexual orientation or their perceived sexual orientation. The following questions address if you've ever had the following experiences because of your real or perceived sexual orientation". Participants responded the frequency with which they had experienced these events (α = .82). |

| STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|
| **12. Martin-Storey & Crosnoe (2012)** | • Harassment due to sexual minority status<br>• Self-concept<br>• Self-regulation<br>• Friendship quality<br>• Parental support<br>• Quality of the school environment | • Harassment due to sexual minority status: Youth were asked if in the past year they had been harassed because of their sexual orientation.<br>• Self-concept: The Identity subscale of the *Psychosocial Maturity Inventory* (Greenberger, 1976) was used which includes questions addressing self-esteem and coherence of self-concept (α = .77; α = .84 for sexual minority youth).<br>• Self-regulation: both primary caregiver's and youths' reported self-control from the subscale of the *Social Skills Rating System* (Gresham & Elliot, 1990), which addresses the youth's ability to self-regulate in emotionally challenging situations (Maternal α = 0.83, 0.87; Adolescent α = .74, .68). These two scales were loaded onto a single factor.<br>• Adolescent perception of friendship quality with a best friend was assessed using a measure based on the *Friendship Quality Questionnaire* (Parker & Asher, 1993) (α = .92, .85 for sexual minority youth).<br>• Parental support: scale which assessed the youth's perceptions of their primary caregiver's caring and attentive behavior, with higher scores reflecting greater maternal warmth (α = .92; .90 for sexual minority youth).<br>• Perceived socioemotional quality of the school environment: latent factor that combined School Attachment (α = .76), Teacher Bonding (α = .61), and Negative Attitudes Towards School (α = .69). The subscales were drawn from the What My School is Like Questionnaire, adapted from the New Hope Study (Duncan, Huston, & Weisner, 2007). |
| **13. McLaren (2006)** | • Sense of belonging | The Psychological subscale of the *Sense of Belonging Instrument* (Hagerty & Patusky, 1995) assessed participants' experiences of feeling valued, needed, and accepted and the perception of fit or connectedness within the general community (α = 0.94 for heterosexuals and α = 0.94 for lesbians). |
| **14. McLaren et al. (2007)** | • Sense of belonging | The *Sense of Belonging Instrument* (Hagerty & Patusky, 1995) was used (see above) with α = 0.95 heterosexuals; α = 0.96 gay males. |
| **15. McLaughlin et al. (2012)** | • Exposure to adversity | Participants were asked about experiences prior to grade 6. Physical abuse by caregivers was assessed with an item that asked respondents to indicate how often their parents or caregivers slapped, hit, or kicked them. Physical abuse was coded as present for respondents who reported more than 5 instances of caregiver physical maltreatment. Sexual abuse was assessed with an item that assessed whether parents or caregivers touched the respondent in a sexual way, forced the respondent to touch them in sexual way, or forced them to have sexual intercourse. This item was dichotomized, with respondents reporting 1 or more incidents of sexual abuse coded as exposed. Two items were used to assess housing-related adversity. Each of these items was coded dichotomously (present/absent). Intimate partner violence (IPV) was assessed with three items, addressing physical violence, sexual violence, and injury. A dichotomous IPV variable was created. An aggregate dichotomous variable was created, with respondents endorsing any of these experiences being coded positively. |
| **16. McNair et al. (2005)** | • Stress<br>• Abuse<br>• Social support | • Stress: The *Perceived Stress Questionnaire for Younger Women* (PSQYW, Bell & Lee, 2002) was used which asks: "Over the last 12 months, how stressed have you felt about the following areas of your life?" regarding 10 items from five life domains including: family of origin, relationships with others, own health, work and money, and study. |

| STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|
| | | • Abuse: Single question "Have you ever experienced any form of physical, mental, emotional or sexual abuse or violence, either as a child or in an adult relationship or at any other time?" (yes/no).<br>• The degree of social support was assessed by a modified version of the *Medical Outcomes Study (MOS) Social Support Scale* (Sherbourne & Stewart, 1991). Respondents were asked "How often is each of the following kinds of support available to you if you need it?", with six items to assess social support in five dimensions: emotional support, information support, tangible support, positive social interaction and affectionate support. |
| **17. Miller & Irvin (2016)** | • Type of victimisation<br>• Emotional support | • Type of victimisation: Measured with three items addressing sexual abuse by a partner, threats of physical abuse by a partner and physical abuse by a partner.<br>• Emotional support: "How often do you get the social and emotional support you need?" |
| **18. Needham & Austin (2010)** | • Parental support | Respondents were asked about relationships with parents. The measure combines respondents' reports of maternal and paternal emotional support during young adulthood and does not include reports of instrumental support. Maternal support is the sum of responses to three items: how close respondents feel to their mother, whether their mother is warm and loving, and whether they enjoy doing things with their mother. The same items used to assess paternal support ($\alpha$ = .83 for the current residential mother support scale, $\alpha$ = 0.74 for the current residential father support scale, $\alpha$ = .86 for the previous residential mother support scale, and $\alpha$ = 0.89 for the previous residential father support scale). Where both maternal and paternal support measures were available, the mean of these items was used to indicate parental support. |
| **19. Pakula et al. (2016)** | • Perceived life stress | Participants were asked: "Thinking about the amount of stress in your life, would you say that most days are: not at all stressful, not very stressful or a bit stressful, quite a bit stressful, or extremely stressful?" Responses were recoded into a binary variable with *not at all stressful* and *not very stressful* categorized as *not stressful* and the remaining responses recoded as *stressful*. |
| **20. Pearson & Wilkinson (2013)** | Family relationships<br>• Perceived parental closeness<br>• Parental involvement<br>• Perceived family support | • Perceived parental closeness: items asking questions about each of the respondents' relationship with their parents e.g. "How close do you feel to your mother/father?". Responses about mothers and fathers were combined by calculating the mean response to all 5 items for each parent ($\alpha$ = .84 for mother, $\alpha$ = .89 for father), and then took the mean of these two values for each respondent.<br>• Parental involvement: the number of the shared activities the respondent participated in with their mother and father in the past 4 weeks: (1) went shopping, (2) played a sport, (3) attended religious services or a church-related event, (4) went to a movie, play, museum, concert, or sports event, and (5) worked on a project for school.<br>• Perceived family support: 5 questions that asked respondents, ''How much do you feel that: (1) your parents care about you? (2) people in your family understand you? (3) you want to leave home? (4) you and your family have fun together? (5) your family pays attention to you?'' ($\alpha$ = .75). |

| STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|
| **21. Przedworski et al. (2015)** | • Social stressors | Two items from the *Everyday Discrimination Scale* (Clark, Coleman, & Novak, 2004) were used (called names / insulted at least a few times a year; harassed or threatened at least a few times a year) and three items from the *UCLA Loneliness Scale* (Russell, 1996) (lack of companionship, feeling left out, and feeling isolated from others at least some of the time). |
| **22. Riley et al. (2016)** | • Stress<br>• Coping styles | • Stress: The 10-item *Perceived Stress Scale* (PSS; Cohen & Williamson, 1988) was used assessing experiences of stress with higher scores reflect greater cognitive appraisal of stressful life circumstances (α = 0.86).<br>• Coping styles: the Brief *COPE* (Carver, 1997), a scale with 14 two-item subscales assessing maladaptive and adaptive coping styles was used: reframing, distraction, instrumental support seeking, active, denial, religion, humor, behavioral disengagement, emotional support seeking, substance use, accepting, planning, blame, and venting emotions. Participants rated their utilization of each coping style. Six scales did not yield adequate reliability and were not included in analyses. The scales included were: Reframing (α = .72); Institution seeking (α = .83); Denial (α = .73); Religion (α = .87); Humor (α = .81); Emotional support seeking (α = .75); Substance use (α = .86); and Blame (α = .71). |
| **23. Robinson et al. (2013)** | • Victimisation | Participants were asked whether they experienced specific forms of peer victimisation (e.g., name calling, threats of physical violence, actual physical violence) during the previous 12 months. In waves 1 to 4, respondents reported whether they experienced each form of peer victimisation; during waves 6 and 7, respondents reported whether they experienced any form of victimisation but were not asked about specific type(s) of victimisation. Peer victimisation was operationalized as both a dichotomous variable (no / some) and a count variable (number of forms of victimisation reported). Parents also reported whether their child was bullied through name calling in wave 1 (no/yes). |
| **24. Rosario et al. (2014)** | • Attachment<br>• Parental affection | • Maternal attachment: scale assessing participants' degree of satisfaction with their relationship with their mother across nine items (e.g. general communication, affection, support, respect, shared time, interests) (Jaccard & Dittus, 1991) (α = .94).<br>• Maternal affection: Mothers reported their satisfaction with their relationship with their child across the same nine items completed by their children on the attachment measure. (α = .94). |

| STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|
| **25. Safren & Heimberg (1999)** | • Stress<br>• Social support<br>• Coping | • Social support: The *Social Support Questionnaire* (SSQ; Sarason, Levine, Basham, & Sarason, 1983) was used which yields scores for number of social supports, satisfaction with social support, and the degree to which a person perceives that he/she is satisfied with social support for help with problems (α = .98 and .96).<br>• Coping styles: Were assessed with the *COPE* (Carver, Scheier, & Weintraub, 1989) which assesses how respondents deal with stressful situations. The researchers selected the factor they believed to have greatest relevance to LGB adolescents. This factor, *coping through acceptance*, contains items that assess coping by accepting one's present circumstances, using restraint, and through positive reinterpretation and growth. Other coping factors were not included.<br>• Life stress: The *Adolescent Perceived Events Scale* (Compas et al., 1987) was used, on which respondents indicated the occurrence of stressful events in the past 4 months and how desirable or undesirable they were on a scale. Event ratings were categorised as negative or positive events, yielding total scores for each category. |
| **26. Sigurvinsdottir & Ullman (2017)** | • Perceived social support<br>• Frequency of social contact | • Perceived social support: The *Social Support Questionnaire* (SSQ; Sarason et al., 1983) was used. Participants were asked to answer Yes/No to whether they experienced any of six items regarding their perception that someone is there for them. (W1: α = .84, W2: α = .87, W3: α = .90).<br>• Frequency of social contact, a measure of social integration, was assessed with 5 questions asking how often a person comes into contact with informal social network members (Donald & Ware, 1984). The composite score was based on the averaged items, with higher scores indicating greater frequency of social contact. (W1: α = .71, W2: α = .71, W3: α = .70). |
| **27. Smith et al. (2016)** | • Institutional betrayal | • Institutional betrayal: A modified version of the *Institutional Betrayal Questionnaire* (IBQ; Smith & Freyd, 2013) was used which measures institutional betrayal leading up to or after sexual assault. The instrument was only given to participants who endorsed at least one at least one item on a sexual harassment and assault scale. Items include 7 questions about the role the institution played in the experience. Three additional items specifically examining the role of sexual orientation in institutional betrayal were added. All participants saw these 10 items, regardless of sexual orientation. |
| **28. Spencer & Patrick (2009)** | • Social support<br>• Personal mastery | • Social support: Measured with the *Medical Outcomes Study Social Support Survey* (MOS-SSS; Sherbourne & Stewart, 1991), which assesses several domains of social support including tangible support, emotional support, affective support, and positive support. Participants were asked how often each type of support was available to them if needed (α = .96).<br>• Personal mastery was measured using the seven-item *Personal Mastery scale* (Pearlin & Schooler, 1978) which assesses generalized expectations about the extent to which one can influence events in one's life, assessing the consciously controlled cognitive-affective aspects of sense of control (α = .79). |

| STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|
| **29. Szalacha et al. (2017)** | • Interpersonal violence | • Interpersonal violence: assessed using the *Composite Abuse* scale (Hegarty & Valpied, 2007). Participants were asked whether or not in the previous three years they had experienced: (1) physical abuse (e.g., pushed); (2) severe physical abuse (e.g. beaten up); (3) emotional abuse (e.g. called names); (4) sexual abuse (e.g. rape or attempted rape); and (5) harassment (e.g. stalking,). An additional question asked whether participants "had ever been in a violent relationship with a partner or spouse". Responses to the items were summed to create a measure of interpersonal violence experiences. |
| **30. Teasdale & Bradley-Engen (2010)** | • Social stress<br>• Social support | • Social stress: Measures of adolescent perceptions of prejudice by students, victimisation experiences, family problems, and suicide of a close friend or family member were created. The adolescent's perceptions of prejudice were measured using a single item, which asked for subject agreement with the statement "Students at your school are prejudiced." Measures of witnessing and experiencing serious violent victimisation were based on responses to three questions. Based on a single item asking how often over the past 12 months "you saw someone shoot or stab another person," a dichotomous measure of witnessing victimisation was created. A similar dichotomous measure of experiencing victimisation was created using a question asking respondents about being shot, stabbed, or hospitalized as the result of a fight. The final dummy variable, representing sexual victimisation, was based on the survey question that asks respondents "Were you ever physically forced to have sexual intercourse against your will?" A measure of family problems was also included based a single item about the adolescent's desire to run away from home. Respondents also reported if a) a relative or b) close friend had attempted or committed suicide over the past year.<br>• Social support: A measure of social acceptance consisted of a single item that asked respondents their level of agreement with the statement "You feel socially accepted." A measure of the subject's perception that she/ he is cared about by others was also included with respondents asked how much they felt that parents, teachers, and friends care about them. |
| **31. Ueno (2010)** | • Victimisation<br>• Major Discrimination Events<br>• Daily Discrimination<br>• Negative life events<br>• Chronic strains | • Victimisation: The *Inventory of traumatic events* (Turner and Lloyd, 2003) was modified to focus on interpersonal coercion and violence.<br>• Major discrimination was the total score from a five-item inventory (Williams, Yu, & Jackson, 1997).<br>• Everyday discrimination was measured by a scale with items measuring minor but chronic and routine discrimination experience in daily life (Williams et al., 1997) ($\alpha = .85$).<br>• Negative life events over a 12-month period were measured by the total score from a 33-item checklist (Avison & Turner, 1988). Some of these items were also asked for partners and friends/relatives and added to each respondent's total score.<br>• Chronic strains: Wheaton's (1994) measure was modified to focus on life domains important for young adults: employment, school, residence, children, relationships with partners or parents, and general perceptions across domains. |

| STUDY | MEDIATORS TESTED | MEASURES FOR MEDIATOR(S) |
|---|---|---|
| | • Family support<br>• Friend support<br>• Optimism<br>• Mastery<br>• Self-esteem<br>• Mattering<br>• Fun-seeking orientation<br>• Relationship status<br>• Number of sexual relationships<br>• Early first sex<br>• Parents' permissiveness of drug use<br>• Friends' permissiveness of drug use<br>• Friends' drug use | • Family support: measured by a scale that focused on emotional support by family (Turner & Marino, 1994) (α = .91).<br>• Friend support was the summed score of eight items similar to family support items (α = .91).<br>• Optimism: *Life Orientation Test* (Scheier, Carver, & Bridges, 1994) (α = .67).<br>• Mastery: Pearlin and Schooler's mastery scale (1978) scale (α = .73).<br>• Self-esteem: Rosenberg's self-esteem (1965) scale (α =.78).<br>• Mattering: summed score from a five-item scale (Rosenberg & McCullough, 1981) (α = .72).<br>• Fun-seeking orientation: measured with the *Fun-Seeking Subscale of Behavioral Activation System* (BAS) (Gray, 1975). The Behavioral Activation System measures the tendency that one's behaviors are motivated by rewards instead of punishments. The Fun-seeking Subscale focuses on the impulsive pursuit of pleasure (α = .66).<br>• Relationship status: dichotomous variable (1 = currently in a marital or dating relationship; 0 = otherwise).<br>• Number of sexual relationships: the lifetime total including opposite-sex and same-sex relationships.<br>• Early first sex: dichotomous variable (1 = had sex before age 15 for men or 16 for women; 0 = otherwise).<br>• Parents' permissiveness of drug use and friends' permissiveness of drug use: summed scores from five-item scales (α = .70 for both parents' permissiveness and friends' permissiveness).<br>• Friends' drug use: summed score of a three-item scale (α = .78). |
| **32. Wong et al. (2017)** | • Dating violence<br>• Sexual orientation concealment | • Dating violence**:** assessed with the Woman Abuse Screening Tool (WAST; Brown, Lent, Schmidt & Sas, 2000) developed to screen and assess physical, psychological and sexual violence at the most recent relationship.<br>• Sexual orientation concealment was assessed with two items: ''How many of your family members know about your sexual orientation?'' and ''How many of your friends know about your sexual orientation?'' |
| **33. Woodford et al. (2015)** | • Interpersonal mistreatment | The researchers constructed measures assessing personal and ambient hostility, incivility, and heterosexist harassment. Survey respondents were asked how often they had witnessed, heard, or knew about (ambient discrimination) and personally experienced each behavior on campus in the past 12 months. Response options for both witnessed and personally experienced questions were: never, once, two to three times, four to nine times, and 10 or more times. Each variable was dichotomized to indicate experience of mistreatment (no = 0, yes = 1). |

*Note:* Cronbach's alphas (α) presented on this table are from the sample of the study in question.

APPENDIX D – ANALYSIS AND FINDINGS

| | STUDY | STATISTICAL ANALYSIS | FINDINGS |
|---|---|---|---|
| 1. | **Almeida et al. (2009)** | • Series of regressions<br>• Sobel test | Perceived discrimination mediated the relationship between sexual minority status and depressive symptoms. The mediation was especially pronounced for boys. |
| 2. | **Burns et al. (2016)** | • Series of regressions | A bisexual but not a homosexual orientation was found to predict increased rates of depression compared to those with a heterosexual orientation. This association was no longer significant when other significant predictors were included in the model, including social support, physical health, smoking status, and history of sexual trauma, suggesting the potential mediating role of these variables (although the authors did not describe these as mediators). |
| 3. | **Burton et al. (2013)** | • Series of regressions<br>• Product of coefficients: bootstrapping | Sexual minority-specific victimisation mediated the effect of reported sexual minority status and depressive symptoms, controlling for baseline depressive symptoms and demographic variables. |
| 4. | **Donahue et al. (2017)** | • Series of regressions | Results suggested that victimisation attenuated the relationship between sexual minority status and depression. This possible mediation effect was greatly decreased when controlling for unmeasured familial confounding by comparing sexual minority youth to their heterosexual same sex twin siblings. |
| 5. | **Frisell et al. (2010)** | • Series of regressions | Adjusting for perceived discrimination and hate crime victimisation reduced the association between same-sex sexual experience and depressive symptoms, suggesting evidence for mediation (although the authors did not describe these as mediators). When controlling for familial confounding with the use of within-twin-pair comparisons, men with same-sex contact and those without did not differ in depression rates. For women, a significant difference based on same-sex contact remained, which disappeared when accounting for perceived discrimination and hate crime victimisation. |
| 6. | **Frost & LeBlanc (2014)** | • Series of regressions<br>• Bootstrapping | Controlling for demographic variables, greater nonevent stress, in the form of barriers to core life pursuits in relationship and work, mediated the association between sexual minority status and depression. |
| 7. | **Hatzenbuehler et al. (2008)** | • SEM<br>• Sobel test | Greater rumination and poorer emotional awareness mediated the relationship between same-sex attraction at and depressive symptoms, controlling for baseline levels of depression. |

| | STUDY | STATISTICAL ANALYSIS | FINDINGS |
|---|---|---|---|
| 8. | **Hatzenbuehler et al. (2012)** | • Series of regressions | Controlling for demographic factors, violence and victimisation, sexual minority status was no longer significantly associated with depression in boys when social isolation was included in the model. No mediation hypotheses were tested for girls, as social network variables were not associated with depression in girls. |
| 9. | **Hughes et al. (2014)** | • Series of regressions | Controlling for demographic variables and parental drinking, no differences in depression were found between heterosexual and lesbian women. However, bisexual women were found to have increased rates of depression, compared to heterosexual women. After adjusting for the number of types of victimisation, the difference in depression between bisexual and heterosexual women was no longer statistically significant. |
| 10. | **la Roi et al. (2016)** | • SEM: Latent Growth Modelling<br>• Product of coefficients | Disparities in depression between sexual minority girls and youth of bisexual identity, present already at age 11, were mediated by both victimisation and parental rejection. Depression differences in boys were not found. However, peer victimisation but not parental rejection mediated the association between sexual minority status and depressive symptoms for boys as well. Both peer victimisation and parental rejection mediated the association between bisexual identity and depressive symptoms. |
| 11. | **Martin-Storey & August (2016)** | • SEM<br>• Bootstrapping | Controlling for socioeconomic status and method of recruitment, the relationship between sexual minority status and depressive symptoms was mediated by harassment due to gender nonconformity. |
| 12. | **Martin-Storey & Crosnoe (2012)** | • SEM<br>• Delta method | Controlling for demographic variables, baseline depression, and maternal depression, harassment due to sexual minority status mediated the association between sexual minority status and depression. Harassment due to sexual minority status was associated with depression via lowered sense of self-concept and negative perceptions of the school environment. |
| 13. | **McLaren (2006)** | • Series of regressions | Controlling for demographic variables, results provide some evidence for mediation of lower sense of belonging in the relationships between of sexual orientation and dysphoria in women. |
| 14. | **McLaren et al. (2007)** | • Series of regressions | Controlling for demographic variables, results provide some evidence for mediation of lower sense of belonging in the association between sexual orientation and dysphoria in men. |
| 15. | **McLaughlin et al. (2012)** | • Series of regressions<br>• Sobel test | Controlling for demographic variables, exposure to early life adversity was a significant mediator of the association between gay and lesbian orientation and depression. |

| STUDY | STATISTICAL ANALYSIS | FINDINGS |
|---|---|---|
| **16. McNair et al. (2005)** | • Series of regressions | Controlling for demographic variables, results suggested that for the younger cohort, all sexual minority women (mainly heterosexual, bisexual, and exclusively/mainly homosexual) had higher rates of depression than heterosexual women and that stress, abuse, and lower social support attenuated these relationships. For the older cohort of women, only the mainly heterosexual group had higher depression rates compared to the heterosexual group, and this difference disappeared when stress, abuse, and lower social support were added to the model. |
| **17. Miller & Irvin (2016)** | • Series of regressions<br>• Sobel test | Controlling for demographic variables, lower emotional support mediated the relationship between sexual orientation and depression for victims of intimate partner violence. The type of abuse experienced (verbal, physical, and sexual) did not mediate the relationship. |
| **18. Needham & Austin (2010)** | • Series of regressions | Bisexual women but not lesbian women had elevated depressive symptoms compared to heterosexual women. Controlling for demographic variables, results were consistent with the suggestion that the association between bisexual identity and depressive symptoms was attenuated when parental support was included in the model. Gay and bisexual men were not found to differ to heterosexual men in depression rates. |
| **19. Pakula et al. (2016)** | • Series of regressions<br>• Product of coefficients: bootstrapping | After controlling for demographic variables, greater life stress significantly mediated the associations between sexual identity and mood disorders for both gay/lesbian and bisexual respondents. |
| **20. Pearson & Wilkinson (2013)** | • Series of regressions<br>• Sobel test | For girls, perceived closeness with parents and family support mediated the association between same-sex attraction and depressive symptoms. For boys, perceived parental closeness mediated the association of same-sex attraction and depressive symptoms. Results suggested that poorer family relationships were a stronger mediator for girls than for boys. |
| **21. Przedworski et al. (2015)** | • Series of regressions | After controlling for demographic variables, results suggested that social stressors decreased the magnitude of the relationship between sexual minority status and depression. |
| **22. Riley et al. (2016)** | • Series of regressions<br>• Bootstrapping | After controlling for demographic and baseline levels of depression, stress and coping styles (denial, blame, reframing & religion) were not found to mediate the relationship between sexual identity and depression. |

| STUDY | STATISTICAL ANALYSIS | FINDINGS |
|---|---|---|
| **23. Robinson et al. (2013)** | • SEM<br>• Unspecified test of significance | In both girls and boys, peer victimisation mediated the disparities in indicators of depressive distress. |
| **24. Rosario et al. (2014)** | • Series of regressions | After controlling for demographic variables and sibling clustering, less secure maternal attachment attenuated the relationship between sexual orientation and depressive symptoms for bisexual and mostly heterosexual participants compared to heterosexual participants. For lesbian and gay participants, the association disappeared once attachment was entered in the model. There was no evidence that maternal affection mediated the depression disparities between the sexual minority subgroups compared to heterosexuals. |
| **25. Safren & Heimberg (1999)** | • Series of regressions | Sexual minority status was related to potential mediators (although the authors did not describe these as mediators) stress and social support, but not acceptance coping. Sexual minority status was related to depression in a univariate model, but this was no longer the case when the stress, social support and acceptance coping variables were added into the model. |
| **26. Sigurvinsdottir & Ullman (2017)** | • Series of regressions<br>• Sobel test | Heterosexual women survivors of sexual assault had lower depressive symptoms than bisexual women survivors. Lower perceived social support mediated the association between sexual orientation and depressive symptoms. |
| **27. Smith et al. (2016)** | • Series of regressions | Results suggested that greater self-reported institutional betrayal attenuated the relationship between LGB status and depression. |
| **28. Spencer & Patrick (2009)** | • Series of regressions | The relationship between sexual orientation and depressive symptoms disappeared when personal resources of social support and mastery were entered into the model. Both social support and personal mastery uniquely contributed to depression variance. |
| **29. Szalacha et al. (2017)** | • Series of regressions | Having a lesbian or bisexual sexual identity was not found to predict depression, while a mainly heterosexual sexual identity was. Despite the number of types of interpersonal violence emerging as the strongest predictor of depression in the model, no evidence for mediation was found. |

| STUDY | STATISTICAL ANALYSIS | FINDINGS |
|---|---|---|
| **30. Teasdale & Bradley-Engen (2010)** | • Series of regressions | Controlling for demographic variables, results suggested that greater social stress (including victimisation, witness victimisation, forced sexual encounters, and suicide of a friend) and lower social support (peers, parents, and teachers perceived care and social acceptance) attenuated the relationship between sexual minority status and depressive outcomes. |
| **31. Ueno (2010)** | • Series of regressions | Victimisation and daily discrimination attenuated the relationship between same-sex contact and depressive symptoms. Negative life events and chronic strain also attenuated the association independently. Similarly, family relationships decreased the relationship, as well as psychological resources (mastery, self-esteem, and mattering). When all the hypothesized mediators were simultaneously entered in the model the difference between those with same-sex contact and those without was greatly reduced but was still significant. There was no evidence that self-exploratory attitudes (including fun-seeking orientation, number of sexual partners, and early sexual initiation) explained the association between same-sex contact and depressive symptoms. The variables of major discrimination, friend support, relationship status, and optimism were not tested for mediation as there were no differences between the groups on these factors. |
| **32. Wong et al. (2017)** | • SEM<br>• Bootstrapping and Sobel test | After controlling for demographic variables and adverse childhood experiences, dating violence and sexual orientation concealment both independently mediated the relationship between sexual minority status and depressive outcomes. |
| **33. Woodford et al. (2015)** | • Series of regressions<br>• Bootstrapping | After controlling for demographic variables, more experiences of interpersonal mistreatment (incivility and heterosexist harassment) mediated the relationship between sexual minority status and depression. |

MAIN EMPIRICAL PROJECT

# Psychosocial mediators of the relationship between sexual minority status and depressive symptoms in a longitudinal sample of young people

**Angeliki Argyriou**

Supervised by Dr Katharine Rimes & Dr Kimberley Goldsmith

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ABSTRACT

**BACKGROUND:** Evidence suggests that sexual minorities – for example people identifying as lesbian, gay or bisexual - experience increased rates of depression compared to heterosexual individuals.

**AIM:** The present study aimed to investigate psychosocial mediators in the relationship between sexual minority status and depressive symptoms in young people. The study is unique in examining the relationship between these factors in a longitudinal design in which the sexual minority status, proposed mediators, and depressive outcomes are measured at different time-points.

**METHODS:** The sample comprised participants from the Avon Longitudinal Study of Parents and Children (ALSPAC), an observational birth cohort study. Sexual minority status was assessed at age 15 years using the respondent's description of their sexual orientation. Depressive symptoms were assessed at age 18 years using the Short Moods and Feelings Questionnaire. Mediators were assessed at age 17 years and included: unhelpful attitudes measured with the Dysfunctional Attitude Scale – Short Form; self-esteem measured with Bachman revision of the Rosenberg's Self-Esteem Scale; and family factors measured with four items assessing the relationship of the respondent with their family. Mediation was assessed using structural equation modelling (SEM) in the Mplus software. Multiple mediation analysis was conducted, with family entered as a latent variable and the three mediators examined in parallel. Potential confounding variables included gender, ethnicity, socioeconomic status, and baseline levels of depression; these were entered as covariates in the model. Gender was also examined as a moderator.

**RESULTS:** Sexual minority youth had higher risk for depressive symptoms at 18 years compared to heterosexual youth. They also had poorer relationships with their family and higher levels of unhelpful attitudes, and there was weaker evidence suggesting lower self-esteem, especially for boys. Poorer family relationships and unhelpful attitudes significantly mediated the relationship between sexual minority status and depression, while there was weaker evidence to support self-esteem as a mediator of the relationship. There was no evidence to suggest that gender moderated these relationships.

**CONCLUSIONS**: Sexual minority youth in the ALSPAC cohort experienced higher levels of depression at 18 years than heterosexual young people. Increased levels of unhelpful attitudes about the self / others, poorer family relationships and possibly lower self-esteem may all contribute to this discrepancy.

*Keywords*: sexual minority, sexual orientation, depression, mediation, family, dysfunctional attitudes, beliefs, self-esteem, ALSPAC

# 1. Introduction

## 1.1. Sexual Minorities and Depression

Sexual minority populations appear to be at increased risk for the occurrence of mental health problems (King et al., 2008; Plöderl & Tremblay, 2015). Depression ranks among the most frequently studied mental health outcomes related to sexual orientation, with literature consistently demonstrating higher rates of depressive symptomatology for both sexual minority adults (e.g. Chakraborty, McManus, Brugha, Bebbington, & King, 2011; King et al., 2008; Pakula & Shoveller, 2013) and youth (e.g. Almeida, Johnson, Corliss, Molnar, & Azrael, 2009; Grant et al., 2014; Hatzenbuehler, McLaughlin, & Nolen-Hoeksema, 2008; Marshal et al., 2011) compared to their heterosexual counterparts.

Minority stress theory has been one of the main theoretical frameworks used to explain the differences in the rates of depression and other mental health problems between sexual minorities and heterosexuals. According to the theory, being a member of a minority group exposes individuals to discrimination, stigma, and prejudice. Such exposure creates a stressful social environment which contributes to the presence of mental health problems (Meyer, 2003). Indeed, studies show that sexual minority individuals experience multiple stressors early in their lives, including peer victimisation, physical assault, abuse, and lack of support or even rejection from family and friends (e.g. Balsam, Rothblum, & Beauchaine, 2005; Corliss, Cochran, & Mays, 2002).

Meyer (2003) argued that experiences of discrimination and rejection represent distal minority stressors which give rise to sexual minority-specific proximal stressors that then affect mental health. Hatzenbuehler (2009) proposed a psychological mediation framework that elaborated on minority stress theory, by suggesting that sexual minority individuals' increased exposure to stressors may have a negative impact on different intra- and interpersonal psychological processes that may then increase vulnerability to mental health problems. While Meyer's work focused on the distal/external stressors that sexual minorities experience as well as the group-specific proximal factors such as internalised homophobia, Hatzenbuehler's framework shifted the focus to the intermediate cognitive, regulatory, and social mechanisms through which minority stressors lead to mental health problems, including depression. Hatzenbuehler suggested that it is not enough to identify the minority stressors that are external to the person but we need to do more to understand "how stigma gets under the skin" of sexual minority individuals, which can also provide

us with opportunities for intervention on the clinical and individual level. Furthermore, Hatzenbuehler emphasised the importance of examining whether general psychological processes that are known vulnerability factors in the general population are heightened in sexual minorities and whether they can therefore help explain the increased prevalence of mental health problems in sexual minorities compared to heterosexuals.

### 1.2. Family Relationships

One possible intermediate factor is relationships with family, which can represent an important interpersonal minority stressor impacting the mental health of LGB people. There is evidence to suggest that sexual minority individuals are at risk for poorer relationships with their parents. For instance, sexual minorities report less secure attachments to their mothers than heterosexuals, even when compared to their heterosexual siblings (Rosario et al., 2014). Moreover, sexual minority adults retrospectively report more parental maltreatment in childhood than heterosexuals (Corliss et al., 2002).

Family rejection following sexual orientation disclosure can be a powerful minority stressor for sexual minority teens, as it may carry with it both emotional and practical difficulties, including limited financial support and in many cases homelessness (Ray, 2006). Even if disclosure has not yet taken place, sexual minority youth may be experiencing concealment stress and fears about future disclosures, which are associated with depressive symptoms (Schrimshaw, Siegel, Downing, & Parsons, 2013; Wong et al., 2017). Anticipation of negative family reactions may reduce a sense of connection with their family members or even cause young people to withdraw from family life limiting their support system.

Literature has documented the importance of family relationships for the mental health of sexual minority individuals. Ryan, Huebner, Diaz, and Sanchez (2009) found that young adults who reported higher rates of family rejection were almost six times more likely to experience depression. Conversely, family acceptance and connectedness have been found to be protective factors against depression (Ryan, Russell, Huebner, Diaz, & Sanchez, 2010), suicidality (Eisenberg & Resnick, 2006; Mustanski & Liu, 2013) as well as other sexual minority stressors such as victimisation (Hershberger & D'Augelli, 1995; Mustanski, Newcomb, & Garofalo, 2011) in sexual minority youth.

Previous studies using mediation methodologies provide some evidence that family factors may help explain depression disparities. For example, a longitudinal study by la Roi, Kretschmer, Dijkstra, Veenstra and Oldehinker (2016) found that parental rejection mediated the relationship between sexual minority identity and depressive symptomatology, although this was only found for adolescent girls and not for boys. Similarly, perceived closeness with parents, parental involvement, and family support mediated the relationship between same-sex attraction and depressive symptoms in a longitudinal sample of adolescents (Pearson & Wilkinson, 2013). This mediational relationship was found in both genders but was more profound in girls. Needham and Austin (2010) demonstrated that the relationship between bisexual identity and depression was attenuated when parental support was entered in their model in a cross-sectional sample of adult women. Ueno (2010) reported a similar finding in a cross-sectional sample of young adults. Finally, Rosario et al. (2014) demonstrated that less secure attachments attenuated the relationship between sexual orientation and depressive symptoms in a longitudinal sample of young adults.

### 1.3. Unhelpful Attitudes

According to the psychological mediation model (Hatzenbuehler, 2009), cognitive processes impacted by exposure to minority stressors can play a part in the development, maintenance, and exacerbation of depressive symptoms. Sexual minorities may be more susceptible to such cognitive vulnerability factors due to their increased risk for stigma experiences. Beck's work on depression (1979) suggests that key cognitive vulnerability factors for depression include certain types of cognitive structures or underlying beliefs. Such beliefs contain unhelpful attitudes towards themselves, others, and the future (e.g. "I should be always happy"; "If I make a mistake then I'm a failure"). These depressogenic attitudes typically involve negative beliefs about the self or others, that are excessive and rigid. Beck suggests that when they are activated, such underlying attitudes result in more 'negative automatic thoughts' that contribute to depressed mood. Research has demonstrated their predictive role in the onset and maintenance of depression (e.g. Alloy et al., 2006). Beck (1979) also suggests that adverse childhood experiences increase the risk for the development of such beliefs.

There has been limited research exploring whether there are disparities between different sexual orientations in cognitive vulnerabilities and whether such disparities may help explain the increased rates of depression in sexual minority populations. Kirsch, Conley,

and Riley (2015) used a composite measure of cognitive vulnerabilities, that included unhelpful attitudes, suppression, and avoidant coping, and showed that sexual minority individuals exhibited higher rates of such cognitive vulnerabilities. Another study found that unhelpful attitudes and negative automatic thoughts mediated the relationship between adverse childhood experiences (peer bullying and abuse by adults) and depression outcomes in a sample of gay and bisexual men. Results from this study also suggested that the role of these more general cognitive factors as mediators was stronger than internalised homophobia, a sexual minority-specific vulnerability (Hart et al., 2017).

### 1.4. Self-Esteem

Another psychological process that may be expected to be causally related to sexual orientation disparities in depression is self-esteem. Under the psychological mediation framework, it is postulated that exposure to minority stressors such as discrimination and social rejection can result in lower self-esteem, and that this in turn may increase risk for psychological disorders. There is evidence from prospective studies that self-esteem is a risk factor for the development of depression (Sowislo & Orth, 2013). Previous research has also suggested that sexual minority adolescents and young adults have lower self-esteem than heterosexuals (Jager & Davis-Kean, 2011; Pachankis & Goldfried, 2006). Low self-esteem has also been found to represent a risk factor for suicidality in this population (e.g. Plöderl & Fartacek, 2005). As self-esteem is a dynamic construct that is vulnerable to internal and external influences during adolescent years (Baldwin & Hoffmann, 2002), it is possible that the self-esteem of sexual minority youth who are exposed to an increased number of stigma-related stressors would be negatively affected.

There have been some cross-sectional studies that examined self-esteem as a mediator in the relationship between sexual minority status and depression. Martin-Storey and Crosnoe (2012) found that self-concept was one of the significant mediators of that association. Similarly, Ueno (2010) showed evidence that controlling for self-esteem, along with mastery and a sense of mattering, attenuated the association between same-sex contact and depressive symptoms. No prospective studies have examined self-esteem as a mediator in a between-group study.

### 1.5. Sex Differences

It is well-documented that females report higher depression (e.g. Salk, Petersen, Abramson, & Hyde, 2016) and lower self-esteem than males (e.g. Bleidorn et al., 2016)

and that such differences are present as early as in adolescence. It is also possible that stigma-related stressors may differ by gender as some literature has suggested that attitudes of heterosexuals towards sexual minority men are different to those towards sexual minority women (Herek, 2000) and that sexual minority men may face increased stigma by heterosexual men (Kite & Whitley, 1996). Moreover, there is some evidence that potential mediating factors between minority sexual orientation and increased depression may be different for boys and girls. For example, two studies found evidence that family-related variables were more important mediators for girls than for boys (la Roi et al., 2016; Pearson & Wilkinson, 2013).

### 1.6. Mediation Analysis

Methodologically, mediation analysis allows for the investigation of intermediate mechanisms, such as those that might help explain the association between sexual minority status and depressive symptoms. Mediation analysis is uniquely placed to examine factors that may help explain the increased prevalence of depressive symptoms in between-group studies, and therefore it has been used in recent literature that seeks to examine aetiological hypotheses of mental health disparities between heterosexuals and sexual minorities (Hatzenbuehler, 2009). In this context, the independent variable is thought to cause change in the intermediate mechanistic variable, which in turn causes change in the outcome (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). The seminal work by Baron and Kenny (1986) defined four steps to infer mediation, otherwise called the Causal Steps approach to mediation: 1) The independent variable predicts the dependent variable (total effect, path *c*); 2) the independent variable predicts the mediator (path *a*); 3) the mediator predicts the dependent variable (path *b*); and 4) the effect of the independent on the dependent variable is attenuated or disappears when the mediator is controlled for (direct effect, path *c'*). These relationships are tested with a series of regressions. See *Figure 1* for a diagrammatic depiction of a mediation model. Although heavily employed in psychological research, the Causal Steps approach has been criticised for not including ways to calculate or make inferences about the indirect effect (MacKinnon et al., 2002). More recent literature has recommended methods to test significance of the indirect effect, using either tests of the joint significance of paths *a* and *b*, the Sobel test of significance of the indirect effect, or bootstrapping to calculate confidence intervals of the indirect effect (MacKinnon, 2001; MacKinnon et al., 2002; MacKinnon, Lockwood, & Williams, 2004; Sobel, 1982, 1986).

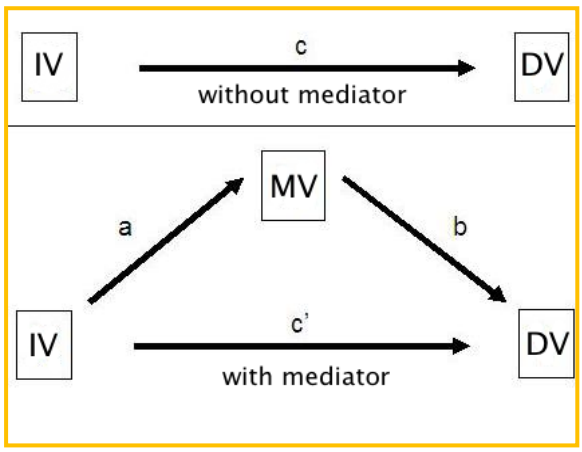


*Figure 1.* A mediation model.

Simple mediation models can be extended to include multiple mediators, including parallel and sequential mediation models (see *Figure 2*). Parallel multiple mediation allows for the different mediators to be explored simultaneously and reports the estimates of indirect effects for each mediator while adjusting for the others (MacKinnon, 2008). Parallel multiple mediation often assumes no causal relationships between mediators, that is mediators may be correlated with each other but not directly causally related (Hayes, 2013). This may often not be a plausible assumption, but it is made to allow for straightforward analysis and interpretation.

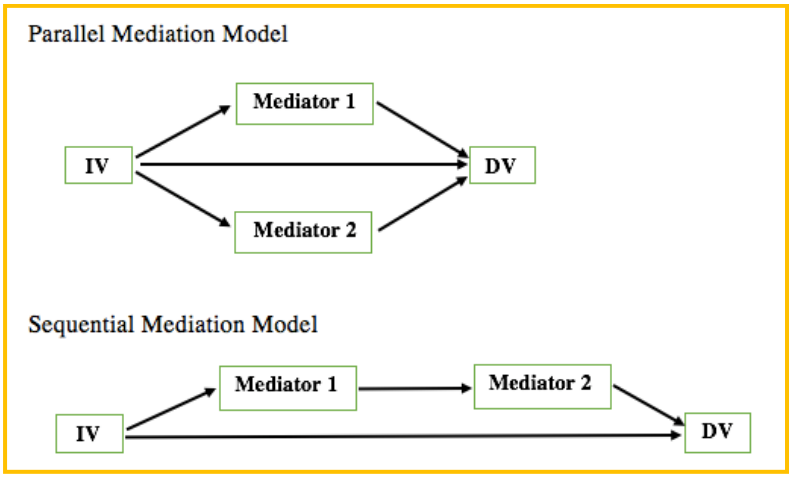


*Figure 2.* Parallel and sequential mediation models.

While mediation analysis can be done via a series of regression models, structural equation modelling (SEM) can also be used to estimate mediation models (MacKinnon, 2008). SEM approaches have the advantage of simultaneously analysing all the relationships in a mediation model while allowing for the inclusion of latent variables (Bollen, 1989). Moreover, popular SEM software solutions such as AMOS (Arbuckle, 2006) and Mplus (Muthén & Muthén, 2017) offer different options to perform inference

for the indirect effects (e.g. Sobel test, bootstrapping).

### 1.7. Limitations of Previous Studies

Existing studies examining mediators of the disparities in depression between sexual minority and heterosexual individuals are largely based on cross-sectional data. Cross-sectional data do not allow the examination of causal pathways and therefore conclusions about the predictive value of sexual minority status and possible mediators cannot be drawn (Cole & Maxwell, 2003; Goldsmith et al., 2017; Goldsmith, Chalder, White, Sharpe, & Pickles, 2016; MacKinnon, 2008).

Moreover, many studies used retrospective accounts to assess mediators (e.g. family relationships) which can suffer from recall biases (e.g. Ueno, 2010). Even studies using longitudinal data often either measure sexual minority status and mediators at time 1 and depression at time 2 (e.g. Burns, Butterworth, & Jorm, 2016), or sexual minority status at time 1 and mediators and depression at time 2 (e.g. Pearson & Wilkinson, 2013). Temporal ordering is important for rigorous study of causal mediation relationships (Cole & Maxwell, 2003). A mediation hypothesis implies a causal chain where the independent variable causes change in the mediator, and the mediator causes change in the dependent variable. This implies that change must occur first in the independent variable, followed in time by change in the mediator, leading to later change in the dependent variable. Therefore, longitudinal studies that measure variables respecting this temporality, for example by measuring the independent variable at a time 1, the mediator at a time 2, and the dependent variable at a time 3, are considered to be necessary for the proper evaluation of mediational relationships.

Another limitation of previous studies is that they have often failed to examine the possible moderating effect of gender when investigating mediational pathways. Given the potential differences in the mediators, outcome, and mediation relationships among males and females (discussed in section 1.6.), gender differences should be investigated in mediational studies in this area.

### 1.8. The Current Study

A better understanding of the intermediate factors contributing to increased depression rates in sexual minorities would be instrumental in designing and refining effective prevention, early intervention, and therapeutic programmes for sexual minority youth

(Windgassen, Goldsmith, Moss-Morris, & Chalder, 2016). Literature has demonstrated the effectiveness of CBT interventions in modifying unhelpful attitudes (Sankar et al., 2015) and self-esteem (Taylor & Montgomery, 2007), while family therapy and community approaches are often geared in improving family relationships. Establishing the importance of these factors for sexual minority youth can provide the evidence-base for targeted-intervention approaches for sexual minority youth.

The present study used existing data from the UK Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort sample to investigate disparities in depression for sexual minority young people compared to heterosexual participants and investigate multiple psychosocial mediators for those disparities. To do so, temporally ordered data were used with sexual minority status measured at age 15, mediators measured at age 17, and depressive symptoms measured at age 18 years. SEM methods were used to assess the extent to which sexual minority status was related to increased depressive symptoms via family relationships, unhelpful attitudes, and self-esteem. The moderating effect of gender on these pathways was also tested.

**Hypotheses:**

a. Depression symptoms at 18 years will be higher in sexual minorities compared to heterosexuals (*c'* path / total effect).
b. Sexual minorities will have poorer family relationships, more unhelpful attitudes, and lower self-esteem at 17 years than heterosexuals (*a* paths).
c. Poorer family relationships, more unhelpful attitudes, and lower self-esteem at 17 years will all be associated with higher depressive symptoms at 18 years (*b* paths).
d. Family relationships, unhelpful attitudes, and self-esteem will each mediate the association between sexual minority status and depressive symptoms (specific indirect effects).
e. As a secondary analysis, sex will be explored as moderating factor of these mediation pathways to examine possible gender differences in each path and in the indirect effect.

## 2. Method

### 2.1. Participants

The sample comprised participants from ALSPAC, an observational cohort prospective study. The study invited all pregnant women who were expected to give birth between

April 1, 1991 and December 31, 1992 in Avon, UK, to enrol, resulting in a cohort of 14,541 pregnancies and 13,988 children alive at age one. The sample was increased to 15,247 during a second recruitment phase when the children were seven years old by sending invites to eligible families that had not previously responded. Compared with the 1991 UK Census data, the ALSPAC sample is slightly more affluent and less likely to be non-white. For further information about the ALSPAC cohort and recruitment phases, see Boyd et al. (2012). Data collection included self-report questionnaires by the young person or their carer and direct assessment at clinics. Details of all the available data can be found on the study website (http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/) through a fully searchable data dictionary. Ethical approval for the birth cohort study was obtained from the ALSPAC Law and Ethics Committee and the Local Research Ethics Committees. Ethical approval for the analysis of secondary data for the current study was obtained from King's College London (Ref. PNM/14/15-67).

## 2.2. Measures

### 2.2.1. Sexual orientation

At age 15, adolescents were asked to choose the 'description that best fits how you think about yourself' with seven different response options provided regarding sexual orientation. A total of 5154 participants responded to this item. Responses were: '100% heterosexual' ($n$ = 4470), 'mostly heterosexual' ($n$ = 441), 'bisexual' ($n$ = 86), 'mostly homosexual' ($n$ = 27), '100% homosexual' ($n$ = 20), 'not sure' ($n$ = 93) or 'not attracted to either sex' ($n$ = 17). For the purposes of this study, participants who responded either 'not sure' or 'not attracted to either sex' were excluded from the analyses. Due to small subgroup sizes, 'mostly heterosexual', 'bisexual', and 'mostly homosexual' responses were combined to define the sexual minority group ($n$ = 574) while the '100% heterosexual' responses defined the heterosexual group ($n$ = 4470).

### 2.2.2. Depression

Depressive symptoms were measured using the Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995). The SMFQ was administered to children at the clinic at different ages including at 13 and at 18. The self-report measure consists of 13 statements, each of which can be rated as 'not true', 'sometimes true', or 'true' by the responded (see Appendix A). The total scores range from 0 to 26, with higher scores indicating more symptoms of depression. The SMFQ was demonstrated to have high validity (Turner,

Joinson, Peters, Wiles, & Lewis, 2014). Internal consistency in the current study was very good (α = 0.91).

### 2.2.3. Family relationships

Family relationships were assessed with a latent factor that was measured by the following four items that participants completed at age 17 years: 1) "How close do you feel to your parents"; 2) "How close do you feel to your siblings?"; 3) "How easy do you find it to discuss your problems with anyone in your family?"; and 4) "How well have you been getting along with your family in the past few months?". Responses were rated on Likert scales ranging from 1 (*very close to at least one*) to 4 (*not close at all to any*) for items 1 and 2, from 1 (*very easy*) to 5 (*very difficult*) for item 3, and from 1 (*very close*) to 5 (*not close at all*) for item 4.

### 2.2.4. Unhelpful attitudes

Unhelpful attitudes were assessed at age 17 with an abbreviated 9-item version of the Dysfunctional Attitudes Scale derived from a factor analysis (Andrews, Levinsohn, Hops, & Roberts, 1993). The Dysfunctional Attitudes Scale (DAS; Weissman, 1979) is a self-report scale designed to assess a variety of rigid, negative, and perfectionist attitudes and unhelpful contingencies for self-evaluation that were proposed by Beck, Rush, Shaw, & Emery (1979) to be vulnerability factors for depression. Example items in this version of the questionnaire include "my value as a person depends greatly on what others think of me" and "I should be able to please everybody" (see Appendix A). Respondents rated their agreement to each of the nine statements on a five-point Likert scale. Scores ranged from 9 to 45, and in the ALSPAC dataset scoring was conducted so that lower scores reflected more unhelpful attitudes. Both the original DAS and the abbreviated version used here have been reported to have good reliability and validity (Andrews et al., 1993; de Graad, Roelofs, & Huibers, 2009; Lewinsohn, Joiner, & Rohde, 2001). Internal consistency in the present sample was good (α = 0.80).

### 2.2.5. Self-esteem

Self-esteem was measured with the Bachman revision (1970) of the Rosenberg Self-Esteem Scale (1965) at age 17 years (RSE-B). The measure consists of 10 statements, which can be rated on a scale from 1 (*almost always true*) to 5 (*never true*). See Appendix A for the full measure. The total scores range from 0 to 40, and higher scores indicate higher self-esteem. Bachman and O'Malley (1977) reported good construct validity for

the measure. Internal consistency for this scale was very good in the present sample (α = 0.89).

### 2.2.6. Potential confounders

The original model was adjusted for a number of confounding variables and an earlier measure of the outcome variable:

*Earlier depressive symptoms*

Following recent recommendations (Dunn, Emsley, Liu, Landau, 2013; Landau, Emsley, & Dunn, 2018; Pickles et al., 2015), baseline measures of the outcome variable were adjusted for in the model, using the SMFQ measures taken at age 13 years.

*Socioeconomic status*

Maternal occupation and maternal education were used as SES indicators. Maternal occupation information was collected from mothers at 18 weeks of pregnancy and was dichotomized into 'non-manual' (I, II, III-non-manual) and 'manual' (III-manual, IV, V) work (Dale & Marsh, 1993). Maternal education information was collected from mothers at 32 weeks of pregnancy and was categorized into 'below O-level', 'O-level' and 'above O-level' (O-levels are school tests taken approximately at age 16 in the UK).

*Ethnicity*

Participants' ethnic group was derived from mothers' reports of their and the children's fathers' ethnic group during pregnancy. Ethnicity was coded dichotomously in the ALSPAC data (white / non-white). Child ethnicity was coded as non-white if either mother or partner ethnicity was reported as anything other than white.

*Sex*

For the main SEM analyses sex was entered as a confounding variable (see 2.3.2.), while it was used as a moderator in supplementary analyses (see 2.3.3.)

It should be noted that the specific timepoints that were selected for each variable were the result of the constraints posed by the variables available in the dataset. Notably, sexual orientation was only assessed at 15 years in the ALSPAC. Consequently, mediators assessed at intermediate timepoints (temporally between the predictor and the outcome) were selected, with unhelpful attitudes, self-esteem, and youth's reports of their

relationships with their families. These variables were also only assessed at 17 years in the ALSPAC.

### 2.3. Statistical Analyses

Preliminary analyses were done on SPSS Version 24 (IBM Corp, 2016) using Pearson's chi-squared tests and t-tests to compare heterosexual participants and sexual minority participants on all variables. Main analyses were conducted using Mplus Version 8 (Muthén & Muthén, 2017).

#### 2.3.1. Missing data methods

Large longitudinal studies like ALSPAC generally suffer from significant attrition and hence missing follow up data. Therefore, listwise deletion analyses of such data would result in diminished statistical power and may give biased results if data are not missing completely at random (MacKinnon, 2008). In the ALSPAC data it is known that factors such as household income and being male predict missingness (Boyd et al., 2012). For the present study, two ways of dealing with missing data were employed: Multiple Imputation (MI) and Full Information Maximum Likelihood (FIML). These two methods are often used to deal with missing data in large datasets (Enders & Bandalos, 2001; Rezvan, Lee, & Simpson, 2015). MI has commonly been used to deal with missing data in longitudinal datasets such as ALSPAC (e.g. Pesola, Shelton, & van den Bree, 2015) and so it was initially the preferred method. However, both for technical reasons explained later, and to compare results from a method that is more straightforward to implement, we also fitted models on non-imputed data using FIML. FIML has been used in other ALSPAC studies as an alternative method for dealing with missing data (Li, Kung, & Hines, 2017).

In MI, missing values are replaced with sets of plausible values based on an imputation model. This results in multiple plausible parameter estimates which are then combined using Rubin's rules (1987). To accommodate the MAR assumption, the imputation model usually incorporates auxiliary variables that are not part of the primary analysis but are assumed to predict missingness. The imputation model is based on the assumption of conditional multivariate normality. In this study, a number of auxiliary variables were included in the model, including socioeconomic indicators, ethnicity, previous depression and self-esteem scores, and gender non-conformity, some of which have been found to predict missingness in the ALSPAC dataset (Boyd et al., 2012). See Appendix B for the

list of variables used in the MI model. It has been recommended that the number of imputations is greater than the maximum percentage of missing data (White, Royston, & Wood, 2011). Given that 91% of the cases in our dataset had missing data on at least one of the model variables (including confounders), we imputed 100 datasets using Mplus. See Appendix C for amount of missing data by variable.

FIML estimates parameters based on all available data without explicitly imputing missing values and is an appropriate technique when data are assumed to be missing at random (MAR) (Enders & Bandalos, 2001). MAR assumes that all variables that predict missing data are known, measured, and included as covariates in the model (Rubin, 1976). FIML then implies likely values of missing data via correlations present in the available data (Enders & Bandalos, 2001). In Mplus, FIML is carried out assuming conditional multivariate normality of all variables in order to simplify computations. FIML was implemented here by conditioning on the covariates, including confounders. This can be done in Mplus by mentioning their variances in the Model command.

Note that cases that had missing data on all the model variables were excluded ($n$ = 521). The final analytic sample used for both types of missing data analyses was $n$ = 14,814.

### 2.3.2. Structural equation modelling (SEM)

The SEM framework allows for fitting multiple regression equations simultaneously. The mediation hypotheses in the present study were assessed using SEM with the three mediators (family relationships, unhelpful attitudes, and self-esteem) examined in parallel. Family was entered as a latent variable. The model was used to test the hypothesis that on average sexual minority adolescents exhibit poorer relationships with their family, higher unhelpful attitudes, and lower self-esteem (*a* paths) which may lead to depressed symptoms (*b* paths). See *Figure 3* for a diagrammatic representation of the hypothesised model.

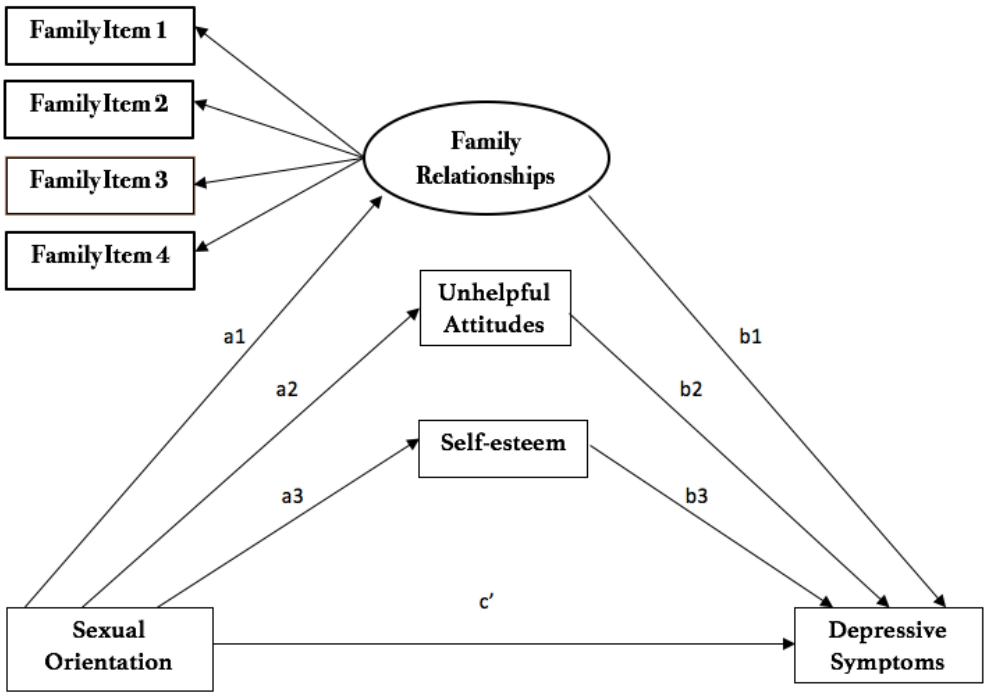


*Figure 3.* Hypothesised parallel mediation model.

The strength of the effects of sexual orientation via each of the mediators on depressed symptoms was estimated by calculating the specific indirect effect of interest. The indirect effects were calculated using SEM path tracing rules, which is sometimes referred to specifically in the mediation context as the product of coefficients method (path *a* × path *b*) (MacKinnon, 2001, 2008; Wright 1920, 1921). The total indirect effect was calculated as the sum of the three specific indirect effects. Note that the *b* paths in the model are each adjusted for the other mediators, as would occur in any regression model.

For both FIML and MI, uncertainty around the estimated indirect and total effects was estimated using bootstrapping methodology. As mentioned, the indirect effects of interest in mediation analysis are products of two model parameters and are generally not normally distributed (e.g. MacKinnon, 2001, 2008; MacKinnon et al., 2004). Presentation of percentile bootstrap confidence intervals for indirect effects has therefore been recommended (Fritz, Taylor, & MacKinnon, 2012). In the case of FIML, 1,000 bootstrap draws were requested and 95% percentile confidence intervals were estimated. In the case of MI, it is not yet clear what the optimal approach to using bootstrapping is (Schomaker & Heumann, 2018), and bootstrapped confidence intervals are not yet implemented in Mplus. Instead, the following methodology was used: 1,000 bootstrap samples were

drawn for each imputed dataset and used to obtain standard errors (SEs) of the estimates. The estimates and their SEs were combined using Rubin's rules. Confidence intervals were then constructed based on asymptotic normal theory (in contrast to the quantile method used in FIML). This methodology has been suggested in recent literature (Schomaker & Heumann, 2018).

Model fit was assessed using the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI; with reference to the null model), and the Standardised Root Mean Square Residual (SRMSR) as recommended for SEM (Hu & Bentler, 1999). The Chi-Square test was not used as it has been suggested that it nearly always rejects the model in large sample sizes (Bentler & Bonnet, 1980). Maximum likelihood estimation was used to estimate the model parameters.

### 2.3.3. Estimates by gender and gender differences

To investigate whether there was differential mediation between girls and boys, one could either perform a multiple-group analysis or include interaction terms with a dummy coded variable for gender. We opted for the former as this is easily implemented in Mplus and allows for all aspects of the structural equation model to differ between boys and girls. The differences between the indirect effects of the two groups were compared in model constraint statements in Mplus, to examine the presence of moderated mediation. The multiple group analysis for gender was not possible to implement in Mplus with MI, as gender was one of the variables that we imputed. It was therefore conducted using FIML with bootstrapped confidence intervals.

## 3. Results

### 3.1. Descriptive Statistics and Preliminary Results

Information on the demographic characteristics of the sample are listed in *Table 1* and means, standard deviations, and t-tests of the rest of the variables in the hypothesised model are presented in *Table 2*. Full details of the responses to individual items measuring family relationships by sexual minority status can be found in Appendix D. Intercorrelations between variables can be found in Appendix E. The descriptive statistics, correlations, chi-squares, and t-tests are based on complete cases (non-imputed data).

Table 1.

*Frequencies, percentages, and chi-square tests of demographic variables.*

| **Variable** | **Categories** | **Heterosexual** *n* (%) | **Sexual Minority** *n* (%) | **Total** *n* (%) | **Pearson $\chi^2$** |
|---|---|---|---|---|---|
| Gender *** | Boys | 2157 (48.3%) | 205 (35.7%) | 7591 (51.2%) | $\chi^2$ (2) = 97.27 |
| | Girls | 2310 (51.7%) | 268 (64.1%) | 7153 (48.3%) | $p$ < .001 |
| | Missing | 3 (0.1%) | 1 (0.2%) | 70 (0.5%) | |
| Ethnicity ** | White | 3914 (87.6%) | 491 (85.5%) | 11,439 (77.2%) | $\chi^2$ (2) = 13.29 |
| | Non-white | 166 (3.7%) | 25 (4.4%) | 610 (4.1%) | $p$ = .001 |
| | Missing | 390 (8.7%) | 58 (10.1%) | 2765 (18.7%) | |
| Maternal Education *** | Below O-level | 776 (17.4%) | 93 (16.2%) | 3733 (25.2%) | $\chi^2$ (2) = 136.48 |
| | O-level | 1449 (32.4%) | 174 (30.3%) | 4300 (29%) | $p$ < .001 |
| | Above O-level | 1907 (42.7%) | 261 (45.5%) | 4356 (29.4) | |
| | Missing | 338 (7.6%) | 46 (8%) | 2425 (16.4%) | |
| Maternal Occupation*** | Manual | 725 (16.2%) | 105 (18.3%) | 2855 (19.3%) | $\chi^2$ (4) = 603.51 |
| | Non-manual | 3012 (67.4%) | 370 (64.5%) | 8182 (55.2%) | $p$ < .001 |
| | Missing | 733 (16.4%) | 99 (17.2%) | 3777 (25.2%) | |

*$p$ <.05. **$p$ <.01. ***$p$ <.001.

Table 2.

*Means, standard deviations (SD), and t-test differences based on summary scores for respondents with complete information on each variable.*

| **Variable** | **Heterosexual** | **Sexual Minority** | **Total** | **T-test results** |
|---|---|---|---|---|
| | *Mean (SD)* | *Mean (SD)* | *Mean (SD)* | (*df*) *t*-statistic, *p*-value (*n*) |
| *Family relationships* | | | | |
| Close to parents *** | 1.69 (0.90) | 1.98 (1.16) | 1.71 (0.94) | $t$ (3220) = -3.80, $p < .001$ ($n$ = 3222) |
| Close to siblings ** | 2.08 (1.30) | 2.33 (1.27) | 2.11 (1.28) | $t$ (3220) = -3.03, $p = .002$ ($n$ = 3222) |
| Discuss problems with family*** | 2.66 (1.33) | 3.10 (1.23) | 2.71 (1.34) | $t$ (3219) = -4.50, $p < .001$ ($n$ = 3221) |
| Get along with family *** | 2.23 (1.11) | 2.57 (1.20) | 2.25 (1.14) | $t$ (3214) = -4.27, $p < .001$ ($n$ = 3216) |
| Unhelpful attitudes *** | 31.80 (6.13) | 30.18 (6.41) | 31.52 (6.23) | $t$ (3509) = 4.21, $p < .001$ ($n$ = 3511) |
| Self-esteem *** | 28.37 (6.38) | 26.18 (6.95) | 27.85 (6.66) | $t$ (3377) = 4.56, $p < .001$ ($n$ = 3379) |
| Depression at 13 years[a] *** | 4.64 (4.20) | 7.31 (5.44) | 4.94 (4.49) | $t$ (4478) = -10.56, $p < .001$ ($n$ = 4480) |
| Depression at 18 years *** | 6.59 (5.85) | 8.84 (6.63) | 7.19 (6.23) | $t$ (2373) = -4.86, $p < .001$ ($n$ = 2375) |

[a] Confounding variable

*$p$ <.05. **$p$ <.01. ***$p$ <.001.

### 3.2. SEM Analyses

The confirmatory factor analysis showed that the measurement model fit the data adequately [CFI = .987; RMSEA = 0.076, (90% CI: 0.058, 0.095), SRMR = .017). In this model, the factor loadings for the four observed family relationships items were statistically significant at $p < .001$ (Item 1 = 0.736, Item 2 = 0.464, Item 3 = 0.676, Item 4 = 0.726). As the results of the model indicated that the observed items were adequate indicators of their corresponding latent construct, structural models were fitted.

The unstandardised estimates, bootstrapped standard errors, p-values, and CIs of all the *a* paths, *b* paths, indirect and total effects of the structural models are summarized in Table 3 and 4 for the SEM analyses using FIML and MI respectively. Mediation results are also shown in *Figure 4* and *Figure 5*.

#### 3.2.1. Mediation with FIML

The fit indices for the hypothesised model were mostly adequate [CFI = 0.87, RMSEA = 0.041, (90% CI: 0.039, 0.043), SRMR = 0.06]. According to Hu and Bentler's (1999) recommended cut-off guidelines, the RMSEA (recommended cut-off < .06) and the SRMR indexes (recommended cut-off < .08) suggested good fit while the CFI index (recommended cut-off > .95) cast some doubt on the adequacy of the model.

Sexual minority status was associated with depression ($\beta$ = 1.07, 95% CI: 0.26, 1.86). Sexual minority status was significantly associated with poorer family relationships ($\beta$ = 0.17, 95% CI: 0.08, 0.25) and unhelpful attitudes ($\beta$ = -0.89, 95% CI: -1.61, -0.18), but not with lower self-esteem ($\beta$ = -0.70, 95% CI: -1.49, 0.05); (*a* paths). Poorer family relationships ($\beta$ = 0.81, 95% CI: 0.34, 1.36), unhelpful attitudes ($\beta$ = -0.11, 95% CI: -0.16, -0.07), and lower self-esteem ($\beta$ = -0.28, 95% CI: -0.32, -0.24) at 17 years were all associated with more depressive symptoms at age 18 (*b* paths). The total indirect path from sexual minority status to depressive symptoms via all the mediators in the model was statistically significant ($\beta$ = 0.43, 95% CI: 0.12, 0.75). The specific indirect path from sexual minority status to depressive symptoms via family relationships was statistically significant ($\beta$ = 0.13, 95% CI: 0.04, 0.26). The indirect path via unhelpful attitudes was also significant ($\beta$ = 0.10, 95% CI: 0.02, 0.17). Suggestive evidence for an indirect path via self-esteem was found but this was not statistically significant ($\beta$ = 0.20, 95% CI: -0.01, 0.42).

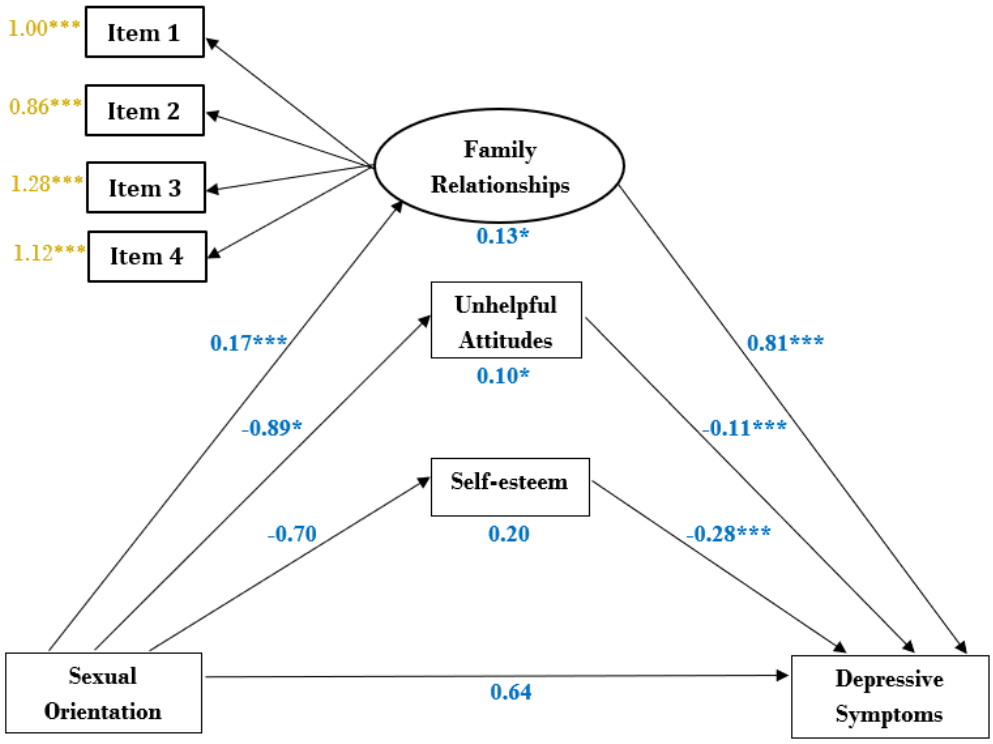


*Figure 4.* Mediation diagram for FIML with bootstrapped confidence intervals. Estimates of factor loadings, specific indirect effects (under each mediator variable), and direct effect are shown.
*$p$ <.05. **$p$ <.01. ***$p$ <.001.

Table 3.
*Results of mediation for FIML with bootstrapped CIs (n = 14,814).*

| Coefficient | Estimate | SE | *p* value | CIs (95%) |
|---|---|---|---|---|
| *a* path | | | | |
| Family | 0.17 | 0.02 | 0.000 | 0.08 / 0.25 |
| Unhelpful attitudes[a] | -0.89 | 0.02 | 0.013 | -1.61 / -0.18 |
| Self-esteem | -0.70 | 0.02 | 0.084 | -1.49 / 0.05 |
| *b* path | | | | |
| Family | 0.81 | 0.03 | 0.001 | 0.34 / 1.36 |
| Unhelpful attitudes[a] | -0.11 | 0.02 | 0.000 | -0.16 / -0.07 |
| Self-esteem | -0.28 | 0.02 | 0.000 | -0.32 / -0.24 |
| Indirect effect | | | | |
| Total | 0.43 | 0.16 | 0.008 | 0.12 / 0.75 |
| Specific | | | | |
| Family | 0.13 | 0.06 | 0.020 | 0.04 / 0.26 |
| Unhelpful attitudes[a] | 0.10 | 0.04 | 0.026 | 0.02 / 0.17 |
| Self-esteem | 0.20 | 0.11 | 0.083 | -0.01 / 0.42 |
| Direct effect (*c'* path) | 0.64 | 0.39 | 0.100 | -0.12 / 1.42 |
| Total effect (*c* path) | 1.07 | 0.41 | 0.009 | 0.26 / 1.86 |

[a] Higher scores indicate lower unhelpful attitudes.

### 3.2.2. Mediation with MI

The fit indices for the hypothesised model were mostly acceptable [CFI = 0.86, RMSEA = 0.035, (90% CI: 0.033, 0.037), SRMR = 0.06]. Based on Hu and Bentler's (1999) recommended cut-off guidelines, the RMSEA (recommended cut-off < .06) and the SRMR indexes (recommended cut-off < .08) suggested good fit while the CFI index (recommended cut-off > .95) cast some doubt on the adequacy of the model.

Sexual minority status was associated with depression ($\beta$ = 1.08, 95% CI: 0.40, 1.77). Sexual minority status was significantly associated with poorer family relationships ($\beta$ = 0.21, 95% CI: 0.10, 0.30), more unhelpful attitudes ($\beta$ = -0.93, 95% CI: -1.62, -0.23), and lower self-esteem ($\beta$ = -0.80, 95 % CI: -1.44, -0.17); (*a* paths). Poorer family relationships, ($\beta$ = 0.56, 95% CI: 0.18, 0.94), unhelpful attitudes ($\beta$ = -0.11, 95% CI: -0.15, -0.07), and lower self-esteem ($\beta$ = -0.26, 95% CI: -0.29, -0.22) at age 17 years were all associated with more depressive symptoms at age 18 (*b* paths). The total indirect path from sexual minority status to depressive symptoms via all the mediators in the model was statistically significant ($\beta$ = 0.43, 95% CI: 0.19, 0.66). The specific indirect path from sexual minority status to depressive symptoms via family was statistically significant ($\beta$ = 0.12, 95% CI: 0.02, 0.22). The indirect path via unhelpful attitudes was also significant ($\beta$ = 0.10, 95% CI: 0.02, 0.19). The indirect path via self-esteem was significant as well ($\beta$ = 0.21, 95% CI: 0.03, 0.38).

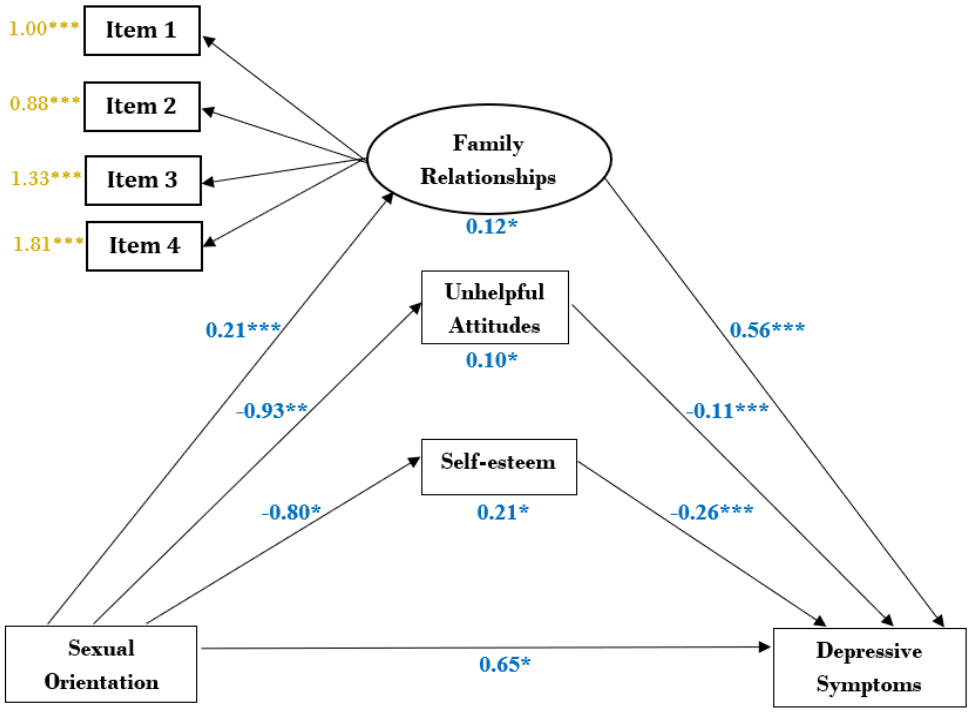


*Figure 5.* Mediation diagram for MI with bootstrapped SEs and symmetric CIs. Estimates of factor loadings, specific indirect effects (under each mediator variable), and direct effect are shown.
*$p$ <.05. **$p$ <.01. ***$p$ <.001.

Table 4.

*Results of mediation for MI with bootstrapped SEs and symmetric CIs (n = 14,814).*

| Coefficient | Estimate | SE | *p* value | CIs (95%) |
|---|---|---|---|---|
| *a* path | | | | |
| Family | 0.21 | 0.06 | 0.000 | 0.10 / 0.30 |
| Unhelpful attitudes[a] | -0.93 | 0.36 | 0.009 | -1.62 / -0.23 |
| Self-esteem | -0.80 | 0.33 | 0.014 | -1.44 / -0.17 |
| *b* path | | | | |
| Family | 0.56 | 0.19 | 0.004 | 0.18 / 0.94 |
| Unhelpful attitudes[a] | -0.11 | 0.02 | 0.000 | -0.15 / -0.07 |
| Self-esteem | -0.26 | 0.02 | 0.000 | -0.29 / -0.22 |
| Indirect effect | | | | |
| Total | 0.43 | 0.12 | 0.000 | 0.19 / 0.66 |
| Specific | | | | |
| Family | 0.12 | 0.05 | 0.015 | 0.02 / 0.22 |
| Unhelpful attitudes[a] | 0.10 | 0.05 | 0.021 | 0.02 / 0.19 |
| Self-esteem | 0.21 | 0.09 | 0.019 | 0.03 / 0.38 |
| Direct effect (*c'* path) | 0.65 | 0.32 | 0.041 | 0.03 / 1.28 |
| Total effect (*c* path) | 1.08 | 0.35 | 0.002 | 0.40 / 1.77 |

[a] Higher scores indicate lower unhelpful attitudes.

### 3.2.3. Estimates by gender

*Table 5* displays the estimates, bootstrapped standard errors, p-values, and CIs of all the *a* paths, *b* paths, indirect and total effects separately for boys and girls. Evidence of an association between sexual minority status and family relationships was found for both boys ($\beta$ = 0.17, 95% CI: 0.05, 0.30) and girls ($\beta$ = 0.17, 95% CI: 0.05, 0.28). Sexual minority status was associated with unhelpful attitudes in boys ($\beta$ = -1.35, 95% CI: -2.32, -0.33) while it failed to reach the 0.05 level of significance in girls ($\beta$ = -0.72, 95% CI: -1.56, 0.18). While there was weak but not statistically significant evidence for an association between sexual minority status and self-esteem for boys ($\beta$ = -1.35, 95% CI: -2.50, 0.01), there was no evidence of such an association for girls ($\beta$ = -0.46, 95% CI: -1.38, 0.50).

While strong evidence of an association between family relationships and depression was found for girls ($\beta$ = 0.99, 95% CI: 0.37, 1.65), no such evidence was found for boys ($\beta$ = 0.33, 95% CI: -0.29, 1.14). Unhelpful attitudes were found to be related with depression for boys ($\beta$ = -0.08, 95% CI: -0.15, -0.02) and girls ($\beta$ = -0.12, 95% CI: -0.17, -0.06). Strong evidence for an association of self-esteem with depression was found for both boys ($\beta$ = -0.19, 95% CI: -0.25, -0.14) and girls ($\beta$ = -0.32, 95% CI: -0.38, -0.27).

Evidence was found for a total effect of sexual minority status on depressive symptoms for boys ($\beta$ = 1.44, 95% CI: 0.26, 2.53), while this was not strongly supported for girls ($\beta$ = 0.89, -0.11, 1.84). There was some evidence to suggest an indirect effect of sexual minority status on depression via family for girls ($\beta$ = 0.16, 95% CI: 0.04, 0.35), while such evidence was weak for boys ($\beta$ = 0.06, 95% CI: -0.05, 0.26). Evidence for an indirect effect of sexual minority status on depression via unhelpful attitudes was moderate for both boys ($\beta$ = 0.11, 95% CI: 0.01, 0.26) and weak but not significant for girls ($\beta$ = 0.09, 95% CI: -0.02, 0.19). Finally, while there was weak evidence that self-esteem mediated the relationship between sexual minority status in boys ($\beta$ = 0.26, 95% CI: 0.00, 0.56), there was no such evidence of mediation for girls ($\beta$ = 0.15, 95% CI: -0.16, 0.45).

### 3.2.4. Gender differences

*Table 6* illustrates the differences between the two gender groups. No evidence was found for differences between boys and girls regarding the specific indirect paths from sexual minority status to depressive symptoms via self-esteem ($\beta$ = -0.11, 95% CI: -0.55, 0.31), unhelpful attitudes ($\beta$ = -0.03, 95% CI: -0.22, 0.15), or family relationships ($\beta$ = 0.11,

95% CI: -0.14, 0.31). Similarly, the total indirect effect was not found to differ significantly between males and females ($\beta$ = -0.03, 95% CI: -0.65, 0.55). Finally, there was no evidence of difference in the direct ($\beta$ = -0.52, 95% CI: -1.99, 1.01) or the total effects ($\beta$ = -0.55, 95% CI: -2.17, 1.06) either. These results suggest no evidence of gender as a moderator.

Table 5.

*SEM estimates by gender.*

| | BOYS | | | | GIRLS | | | |
|---|---|---|---|---|---|---|---|---|
| **Coefficient** | **Estimate** | **SE** | ***p* value** | **CIs (95%)** | **Estimate** | **SE** | ***p* value** | **CIs (95%)** |
| *a* path | | | | | | | | |
| Family | 0.17 | 0.07 | 0.009 | 0.05 / 0.30 | 0.17 | 0.06 | 0.005 | 0.05 / 0.28 |
| Unhelpful attitudes [a] | -1.35 | 0.52 | 0.009 | -2.32 / -0.33 | -0.72 | 0.45 | 0.115 | -1.56 / 0.18 |
| Self-esteem | -1.35 | 0.70 | 0.053 | -2.50 / 0.01 | -0.46 | 0.48 | 0.332 | -1.38 / 0.50 |
| *b* path | | | | | | | | |
| Family | 0.33 | 0.38 | 0.382 | -0.29 / 1.14 | 0.99 | 0.33 | 0.003 | 0.37 / 1.65 |
| Unhelpful attitudes [a] | -0.08 | 0.04 | 0.019 | -0.15 / -0.02 | -0.12 | 0.03 | 0.000 | -0.17 / -0.06 |
| Self-esteem | -0.19 | 0.03 | 0.000 | -0.25 / -0.14 | -0.32 | 0.03 | 0.000 | -0.38 / -0.27 |
| Indirect effect | | | | | | | | |
| Total indirect | 0.43 | 0.19 | 0.025 | 0.08 / 0.83 | 0.40 | 0.23 | 0.079 | -0.05 / 0.86 |
| Specific indirect | | | | | | | | |
| Family | 0.06 | 0.08 | 0.467 | -0.05 / 0.26 | 0.16 | 0.08 | 0.037 | 0.04 / 0.35 |
| Unhelpful attitudes [a] | 0.11 | 0.07 | 0.108 | 0.01 / 0.26 | 0.09 | 0.06 | 0.139 | -0.02 / 0.19 |
| Self-esteem | 0.26 | 0.14 | 0.063 | 0.00 / 0.56 | 0.15 | 0.16 | 0.335 | -0.16 / 0.45 |
| Direct effect (*c'* path) | 1.01 | 0.57 | 0.075 | -0.12 / 2.06 | 0.49 | 0.48 | 0.302 | -0.40 / 1.36 |
| Total effect (*c* path) | 1.44 | 0.58 | 0.014 | 0.26 / 2.53 | 0.89 | 0.50 | 0.078 | -0.11 / 1.84 |

[a] Higher scores indicate lower unhelpful attitudes.

Table 6.

*Moderation results. Estimates of gender differences in effects between boys and girls.*

| **Coefficient** | **Estimate** | **SE** | ***p* value** | **CIs (95%)** |
|---|---|---|---|---|
| Total indirect | -0.03 | 0.30 | 0.919 | -0.65 / 0.55 |
| Specific indirect | | | | |
| Self-esteem | -0.11 | 0.21 | 0.599 | -0.55 / 0.31 |
| Unhelpful attitudes [a] | -0.03 | 0.09 | 0.767 | -0.22 / 0.15 |
| Family relationships | 0.11 | 0.11 | 0.308 | -0.14 / 0.31 |
| Direct effect | -0.52 | 0.76 | 0.494 | -1.99 / 1.01 |
| Total effect | -0.55 | 0.80 | 0.49 | -2.17 / 1.06 |

[a] Higher scores indicate lower unhelpful attitudes.

# 4. Discussion

The present study explored family relationships, unhelpful attitudes, and self-esteem as mediators of the relationship between minority sexual orientation and depressive symptoms. This is the first study that used temporally ordered prospective data at three timepoints to conduct mediation analysis, which is recommended in literature as it provides stronger evidence for possible causal relationships (Maxwell & Cole, 2007). It is the also first study that tests unhelpful attitudes as a mediator, and the first in the UK to explore family relationships and self-esteem. It is one of very few UK studies to use a longitudinal design to test these possible mechanisms.

## 4.1. Summary of Findings

As expected, youth who reported sexual minority status at age 15 reported higher depressive symptom scores at age 18 than heterosexual youth. This difference was present as early as age 13. The hypothesised mediation model may help explain these disparities. The results from both statistical methodologies used suggested that family relationships and unhelpful attitudes at age 17 mediated the relationship between sexual minority status and depressive symptoms. Self-esteem was found to be a significant mediator using the MI and symmetric CIs approach, but not the FIML and bootstrapped CIs approach, although it did approach statistical significance with the latter approach as well. The differences in findings are due to a somewhat weaker relationship found between sexual minority status and self-esteem using the FIML approach than the MI approach. It should be noted that the differences between results of the two different methodologies used were minor and can probably be attributed to the different approaches to dealing with missing data and associated differences in standard errors.

## 4.2. Theoretical Implications

### 4.2.1. Psychological mediation framework

In general, the findings of this study are in line with the psychological mediation framework (Hatzenbuehler, 2009) that suggests that general psychological processes known to confer risk for mental health problems in the general population are elevated in sexual minorities compared to their heterosexual counterparts and are causally related to later depressive disparities. According to Hatzenbuehler's model, both unhelpful attitudes and self-esteem can be thought as cognitive psychological processes, while perceptions of family relationships can be conceptualised as a social/interpersonal mediator. The

current study demonstrated how these proximal mediators mediate the relationship between minority status and depressive symptomatology. Minority stress theories (Meyer, 2003; Hatzenbuehler, 2009) propose that these psychological vulnerability factors are increased in sexual minority individuals due to stigma-related stressors, but this was not directly tested in the present study. Hatzenbuehler's (2009) mediation model suggests that minority status leads to stigma-related stressors that then lead to individual psychological processes which in turn lead to increased risk for mental health problems. Future studies can therefore attempt to test this full mediation model, by using for instance serial mediation pathways to demonstrate how sexual minority status leads to increased exposure to prejudice events which may lead to increased levels of these psychological mediation processes and with these processes then contributing to the increased rates of depression symptomatology.

### 4.2.2. Family relationships

The finding that poorer family relationships was found to be one of the factors contributing to the depression disparities between sexual minority and non-sexual minority young people is in line with previous evidence of an association between family rejection of sexual identity or gender expression and depression in sexual minority youth (Ryan et al., 2009). There has also been some evidence supporting the role of parental or family support, parental rejection, and attachment as intermediate mechanisms found in some cross-sectional studies (Needham & Austin, 2010; Rosario et al., 2014; Ueno, 2010) but also two longitudinal studies in samples of Dutch and American adolescents (la Roi et al., 2016; Pearson & Wilkinson, 2013). The present study is the first study that has provided support for this mechanism in a UK youth sample.

### 4.2.3. Unhelpful attitudes

This is the first study that has provided evidence that unhelpful attitudes mediate the relationship between minority sexual orientation and increased depressive symptoms. The current findings are consistent with longitudinal research in the general population that unhelpful attitudes are a risk factor for depression (Abela & D'Alessandro, 2002; Hankin, Wetter, Cheely, & Oppernheimer; 2008; Lewinsohn et al., 2001). These results are also consistent with Beck's (1979) cognitive model of depression which proposes that negative attitudes towards the self and others are a vulnerability factor for depression. Beck proposes that such beliefs develop due to negative life experiences but may lie dormant until activated by subsequent life stressors. This diathesis-stress model has been

supported by studies in the general population (e.g. Abela & D'Alessandro, 2002; Lewisohn et al., 1999) but future research could investigate the types of life experiences that contribute to the development and activation of these unhelpful attitudes in sexual minority youth. For example, their elevated rates of childhood abuse (Friedman et al., 2011) and victimisation and stigma relating to their sexual orientation or associated precursors such as childhood gender nonconformity (Roberts et al., 2013; Toomey, Caitlin, Diaz, Card, & Russell, 2010) may contribute to the development of such beliefs which may then become activated by other life stressors.

#### 4.2.4. Self-esteem

This is the first longitudinal study examining self-esteem as a mediator of the association between sexual orientation and depression in a between-group sample of young people. Evidence from the current study that self-esteem plays a role in the association between minority sexual orientation and depressive outcomes was mixed. This is in line with previous inconsistent evidence from cross-sectional or within-group studies: Some previous cross-sectional studies provided evidence of the role of self-esteem as a mediator in the relationship between sexual minority status and depression (Martin-Storey & Crosnoe, 2012; Ueno, 2010) while others found it to be less important when looking other related outcomes such as suicidality and emotional distress (Rosario, Rotheram-Borus, & Reid, 1996; Wichstrom & Hegna, 2003). In the present study, the association between sexual orientation and self-esteem was significant in the MI model but was not significant when using the FIML method, which then led to an absence of a significant mediation effect. As self-esteem rates differed between sexual minority and heterosexual youth in preliminary analyses (see *Table 2*), it seems that controlling for earlier levels of depression and demographic characteristics attenuated the relationship between sexual orientation and self-esteem. Indeed, depressive symptoms are more strongly associated with self-esteem than with family relationships or unhelpful attitudes, so it is not surprising that adjusting for prior depression had more impact on this association.

#### 4.2.5. Gender

There was no evidence to support gender as a moderating factor of any of the pathways. Nevertheless, stronger evidence was found for some associations in boys compared to girls, and vice versa. While sexual minority status was related with poorer family relationships for both boys and girls, poorer family relationships were associated with depressive symptoms in girls, while this relationship was not shown in boys. Therefore,

family relationships emerged as a mediator for girls but not for boys. This is consistent with findings of other longitudinal research with Dutch and American adolescents, suggesting that family-related variables such as parental rejection or parental closeness, support, and involvement appears to be stronger mediators of the relationship between sexual orientation and depression for girls than for boys (la Roi et al., 2016; Pearson & Wilkinson, 2013). On the other hand, there was evidence to suggest that self-esteem was a weak mediator for boys, but not for girls, as self-esteem did appear to be related with sexual minority status for boys, while the same relationship was not found for girls. It has been reported that attitudes are often more negative toward sexual minority males than females (Kite & Whitley, 1996) and that sexual minority men may be victimised and discriminated against more (Kuyper & Fokkema, 2011), which may explain why their self-esteem may be particularly affected. It can also be argued that the impact of minority stressors relating to sexual orientation on self-esteem may be less apparent in the young women because self-esteem is generally lower in females than males (Bleidorn et al., 2015), presumably due to sexism and gender-based victimisation. Indeed, self-esteem was lower in females in the present study (see Appendix F for t-tests for gender differences). Females are exposed to gender-based stigma processes from birth and these may have a larger impact than sexual orientation differences which only become relevant later in life and which are generally less apparent.

### 4.3. Clinical Implications

The findings have important implications in terms of primary and secondary prevention. Firstly, these UK findings support many other studies (e.g. King et al., 2008) indicating that sexual minority youth should be recognised as an at-risk population for depression. Specifically, our findings suggested a total effect of sexual minority status on depressive symptoms of slightly over one point in the SMFQ depression scale. While this is not a very large effect, it implies that significantly more sexual minority young people are going to meet clinical thresholds of depression. This may be clinically meaningful in the developmentally sensitive period of late adolescence when young people often find themselves dealing with important life tasks such as identity formation, social development, and educational and vocational achievement.

Secondly, knowledge of psychosocial processes that act as vulnerability factors provides specific targets for preventative and therapeutic efforts. Approximately 40% of the disparity in depressive symptoms between sexual minority and heterosexual young

people in this sample was accounted for by the three mediators considered. It has been argued that the multiple biological, social, and cognitive risk and vulnerability factors for depression are not adequately addressed in existing cognitive models of major depression and that taking these into account can provide opportunities for more complex and explanatory models of depression that accounts for different presentations (Dobson & Dozois, 2008). Despite the relatively small effects of each of the mediators on depressive outcomes, it is thus important to consider the possible clinical significance of each of these factors when assessing, formulating, and treating sexual minority youth.

The current findings suggest that psychological interventions for sexual minority youth should attend to unhelpful attitudes and rules about the self and others, and negative overgeneral beliefs about the self (low self-esteem). Addressing these beliefs is typically a core component of cognitive behaviour therapy (CBT) for depression. Promising results have been found in pilot studies investigating a computerised CBT programme specifically adapted for sexual minority teenagers with depression (Lucassen, Merry, Hatcher, & Frampton, 2015), group CBT for sexual minority youth (Craig & Austin, 2016), and LGB affirmative CBT for gay and bisexual men (Pachankis, Hatenbuehler, Rendina, Safren, & Parsons, 2015). However, LGB-specific interventions for young people are not provided in the NHS in the UK.

Recently, research and practice has been focused on resilience as a protective factor for sexual minorities (Mustanski et al., 2011). Although resilience is a poorly understood process, self-esteem has been shown to be an important aspect of it (Anderson, 1998). The presence of community and school-based programs that facilitate positive identity development (e.g. Asakura, 2010) as well as interventions that focus on building sexual minority young people's self-esteem (e.g. Craig, McInroy, Austin, Smith, & Engle, 2012) are likely to be protective for this population.

Furthermore, the importance of family relationships in contributing to depressive symptoms in this population highlights the need for research evaluating the impact of interventions that facilitate awareness, normalization and education to parents and families. Research on interventions that focus on the family relationships of sexual minority youth is scarce (Diamond et al., 2012; Willoughby & Doty, 2010; Woodward & Willoughby, 2013). Although recommendations for family interventions exist (Woodward & Willoughby, 2013), they are not based on a solid evidence base. Young

people who come out to their families (or who are 'outed' without their consent) may also need support coping with any adverse reactions including the possibility that they will be made homeless. Young people who do not come out due to fears of negative family reactions require a different kind of support, that takes into account that they may be correct in their anticipated family rejection.

### 4.4. Limitations

Like most longitudinal cohort studies, ALSPAC suffers from significant attrition which may lead to biased estimates. Two different methods were used to deal with missing data, both of which are known to reduce statistical bias when data are not missing completely at random, as well as increase power. These two methods led to similar results.

Limitations that are associated with the use of a mediation framework are also worth noting. The use of multiple mediators in parallel in mediation analysis entails the assumption that the mediators are causally independent from each other (Hayes, 2013). We cannot know that this assumption is met for the mediators used in the current study. For instance, there is evidence to suggest that self-esteem is associated with good relationships with parents (Savin-Williams, 1989) and with family acceptance (Ryan et al., 2010) although it is unclear whether this relationship is causal. Beck's (1979) cognitive model would also suggest that overgeneral negative beliefs about the self, as typical in low self-esteem, is likely to be associated with negative specific attitudes and rules about the self. More generally, it is very difficult to infer causal relationships based solely on observational data, and results obtained from SEM will be biased if causal structures are misspecified or there are unobserved confounders. Hence, analyses such as the ones presented here do not provide conclusive evidence of some causal structure. Instead, they examine whether a causal theory is consistent with observational data, and pre-supposing that this causal structure is correct, perform inference for the parameters of the causal model. Further, as previously discussed, mediation studies with a longitudinal design are methodologically superior than cross-sectional mediation studies in that they acknowledge that mediation processes unfold over time. However, in the present study assumptions are being made about the timing of the effects of sexual minority status on the mediators, and of the mediators on depressive symptoms. Ideally, when the hypothesised timings of the effects are unknown as they are in this model, multiple measures should be collected at different timepoints so that the nature of how the causal process unfolds could be better modelled. Due to the inherent limitations of

using with an existing dataset this was not possible in this study.

The importance of the inclusion of confounding variables including baseline confounders in mediation models has been extensively discussed in literature (Goldsmith et al., 2016; MacKinnon, 2008; VanderWeele & Vansteelandt, 2009; Dunn, et al., 2013; Pickles et al., 2015). In the present study, sociodemographic confounding variables as well as the baseline confounder of the outcome variable were included in the model. Baseline measures of the mediators were not available from the ALSPAC dataset so could not be included here as confounders. However, the use of baseline measures of the mediators in this context may lead to an overadjustment bias. Sexual orientation has temporal continuity (i.e. present before being measured in this study) and is also significantly associated with earlier childhood gender nonconformity (Li et al., 2017) which can make young people a target for victimisation (e.g. Roberts et al., 2013; Toomey et al., 2010). It is therefore possible that minority stressors already present prior to age 15 could had influenced earlier levels of the hypothesised mediators. Thus, adjusting for earlier measures of the mediators could lead to a reduction or removal of the current mediation effects in a misleading way.

In the present study, a self-report measure assessing the number of depressive symptoms was used rather than a diagnostic tool for major depression. Future studies should investigate whether similar results are found when using clinical structured assessment of major depression as an outcome variable. Moreover, the family relationships variable was not measured by a validated questionnaire and therefore questions can be raised about its validity and reliability. However, exploratory factor analysis on SPSS (data not shown) and confirmatory factor analysis on Mplus have provided evidence for the items loading to a single factor with high factor loadings. Furthermore, the use of single-source self-reports as measures for all variables may result in what is known as common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Common method bias refers to the systematic measurement error that may occur when constructs are measured using the same methods and may result in inflated relationships among variables. However, the temporal separation of baseline, predictor, mediators, and dependent variables in the current study may help address this source of bias (Podsakoff et al., 2003).

Lastly, different sexual minority subgroups were grouped together due their small sizes. However, literature has suggested that some groups such as bisexual people may be at

more risk than others (Ross et al., 2018). There is also evidence that suggests that 'mostly heterosexual' youth can be considered a separate group (Savin-Williams & Vrangalova, 2013) that may also be vulnerable compared to heterosexuals (Corliss et al., 2009). It would be hence important for future research to explore differences among different sexual minority orientations in intermediate mechanisms contributing to depression disparities.

### 4.5. Conclusions

Results provide evidence for the importance of family relationships and unhelpful attitudes in explaining disparities in depressive symptoms between heterosexual and sexual minority youth, and there is weaker support that self-esteem may also help explain the disparities. The results do not provide conclusive evidence for gender differences in these mediational pathways. Future studies should further investigate such differences, along with differences across sexual minority subgroups.

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APPENDIX A – SELF-REPORT MEASURES

**Short Mood and Feelings Questionnaire (SMFQ)**

*These questions are about how you may have been feeling or acting recently. For each question, please say how much you think you have felt or acted tis way in the past two weeks.*

1. I felt miserable or unhappy
2. I have been having fun
3. I didn't enjoy anything at all in the last two weeks
4. I was very restless
5. I felt I was no good anymore
6. I cried a lot
7. I felt happy
8. I found it hard to think properly or concentrate
9. I hated myself
10. I enjoyed doing lots of things
11. I felt I was a bad person
12. I felt lonely
13. I though nobody really loved me

Response options:

- True
- Sometimes True
- Not True

**Abbreviated Dysfunctional Attitude Scale**

*The sentences below describe people's attitudes. Circle the number which best describes how much each sentence describes your attitude. Your answer should describe the way you think most of the time.*

1. I should be able to please everybody
2. My life is wasted unless I am a success
3. My value as a person depends greatly on what others think of me
4. If a person has to be alone for a long period of time, it follows that he/she has to feel lonely
5. If a person is not a success, then his / her life is meaningless
6. If someone performs a selfish act, this means he/she is a selfish person
7. I should be happy all the time
8. If I do well, it is probably due to chance; if I do badly, it is probably my own fault
9. Turning to someone else for advice is an admission of weakness

Response options:

- Totally agree
- Agree Somewhat
- Neutral
- Disagree Somewhat
- Totally disagree

**Bachman revision of the Rosenberg Self-esteem scale (RSE-B)**

*Below are some statements, please say how true they are of you:*

1. I feel that I'm a person of worth, at least on an equal plane with others
2. I feel that I have a number of good qualities
3. I am able to do things as well as most other people
4. I feel that I do not have much to be proud of *
5. I take a positive attitude towards myself
6. I think I am no good at all *
7. I am a useful person to have around
8. I feel I can't do anything right *
9. When I do a job, I do it well
10. I feel that my life is not very useful *

Response options:

- Almost always true
- Often true
- Sometimes true
- Not often true
- Never true

APPENDIX B – MULTIPLE IMPUTATION MODEL

| Class | Variables | Measure | Age |
|---|---|---|---|
| **Main variables** | Sexual minority status | Self-description | 15y |
| | Self-esteem | Bachman revision of Rosenberg scale | 17y |
| | Family relationships | 4 items, Latent variable | 17y |
| | Unhelpful attitudes | DAS-SF | 17y |
| | Depression | SMFQ | 18y |
| **Covariates** | Gender | Binary (male / female) | At birth |
| | Ethnicity | Binary (white / non-white) | 32wk gestation |
| | Socio-economic status | Maternal education | 32wk gestation |
| | Socio-economic status | Maternal occupation | 18wk gestation |
| **Baseline covariate** | Depression | SMFQ | 13y |
| **Additional auxiliary variables** | Self-esteem | Harter's self-perception scale, global score | 8y |
| | Self-esteem | Butler's self-image profile for children | 13y |
| | Depression | SMFQ | 10.5y |
| | Depression | SMFQ | 16y |
| | Gender non-conformity | Children's activities inventory (CAI) | 8.5y |

APPENDIX C – MISSING DATA

| Variable | Type of variable | Missing data (%) |
|---|---|---|
| Sex | Moderator | 0.5% |
| Ethnicity | Covariate | 18.7% |
| Maternal occupation | Covariate | 25.5% |
| Maternal education | Covariate | 16.4% |
| Sexual minority status | Independent variable | 66% |
| Depression at 10 years | Used in MI model | 51% |
| Depression at 13 years | Covariate | 60% |
| Depression at 16 years | Used in MI model | 66.1% |
| Depression at 18 years | Dependent variable | 77.9% |
| Self-esteem at 8 years | Used in MI model | 53.8% |
| Self-esteem at 13 years | Used in MI model | 54.1% |
| Self-esteem at 17 years | Mediator | 70.1% |
| Unhelpful attitudes at 17 years | Mediator | 70.1% |
| Family items at 17 years | Mediator | 77.5% |
| Gender non-conformity at 8 years | Used in MI model | 53% |

APPENDIX D -

RESPONSES TO FAMILY RELATIONSHIPS ITEMS BY SEXUAL ORIENTATION

| Item | Categories | Heterosexual *n* (%) | Sexual Minority *n* (%) |
|---|---|---|---|
| 1. How close young person feels to their parents | Very close to at least one | 1367 (47.9%) | 136 (37%) |
| | Quite close to at least one | 1202 (42.1%) | 176 (47.8%) |
| | Not very close to either | 224 (7.8%) | 40 (10.9%) |
| | Not close at all to either | 43 (1.5%) | 13 (3.5%) |
| | No parents | 0 (0%) | 0 (0%) |
| | Don't know | 18 (0.6%) | 3 (0.8%) |
| 2. How close young person feels to their siblings | Very close to at least one | 1055 (37%) | 98 (26.6%) |
| | Quite close to at least one | 1161 (40.7%) | 154 (41.8%) |
| | Not very close to either | 342 (12%) | 67 (18.2%) |
| | Not close at all to either | 91 (3.2%) | 18 (4.9%) |
| | No siblings | 175 (6.1%) | 29 (7.9%) |
| | Don't know | 30 (1.1%) | 2 (0.5%) |
| 3. How easy young person finds it to discuss their problems with anyone in the family | Very easy | 504 (17.7%) | 39 (10.6%) |
| | Quite easy | 986 (34.6%) | 106 (28.8%) |
| | Neutral | 688 (24.1%) | 96 (26.1%) |
| | Quite difficult | 542 (15.8%) | 87 (23.6%) |
| | Very difficult | 201 (7%) | 39 (12.5%) |
| | Don't know | 22 (0.8%) | 1 (0.3%) |
| 4. How well young person has been getting along with their family in the past few months | Very close | 743 (26.1%) | 68 (18.5%) |
| | Quite close | 1221 (42.9%) | 146 (39.8%) |
| | Neutral | 631 (22.1%) | 102 (27.8%) |
| | Not very close | 189 (6.6%) | 38 (10.4%) |
| | Not close at all | 53 (1.9%) | 11 (3%) |
| | Don't know | 12 (0.4%) | 2 (0.5%) |

APPENDIX E - INTERCORRELATIONS

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. F1: Close to parents | | .344* | .487* | .534* | -.128* | -.223* | .095* | -.176* |
| 2. F2: Close to siblings | | | .314* | .275* | -.077* | -.140* | .100* | .155* |
| 3. F3: Discuss problems with family | | | | .571* | -.200* | -.297* | .147* | .197* |
| 4. F4: Get along with family | | | | | .170* | -.310* | .153* | .260* |
| 5. Unhelpful attitudes | | | | | | .359* | -.200* | -.293* |
| 6. Self-esteem | | | | | | | -.261* | -.462* |
| 7. Depression at 13 | | | | | | | | .320* |
| 8. Depression at 18 | | | | | | | | |

*Correlation is significant at $p < .001$.

APPENDIX F – T-TESTS FOR GENDER DIFFERENCES

| **Variable** | **Boys** *Mean (SD)* | **Girls** *Mean (SD)* | **t-test, *p*-value** (*n*) |
|---|---|---|---|
| *Family relationships* | | | |
| Close to parents | 1.70 (0.93) | 1.69 (0.93) | $t$ (4096) = .08, $p$ = .94 ($n$ = 4098) |
| Close to siblings * | 2.15 (1.32) | 2.06 (1.26) | $t$ (4096) = 2.29, $p$ = .022 ($n$ = 4098) |
| Discuss problems with family | 2.73 (1.32) | 2.67 (1.29) | $t$ (4093) = 1.53, $p$ = .126 ($n$ = 4095) |
| Get along with family ** | 2.16 (1.05) | 2.25 (1.11) | $t$ (4087) = -2.80, $p$ = .005 ($n$ = 4089) |
| Unhelpful attitudes | 31.66 (5.82) | 31.59 (6.32) | $t$ (4090) = 0.36, $p$ = .722 ($n$ = 4492) |
| Self-esteem *** | 29.42 (6.31) | 27.17 (6.64) | $t$ (4094) = 11.50, $p$ < .001 ($n$ = 4496) |
| Depression at 13 years[a] *** | 4.09 (3.80) | 5.71 (4.93) | $t$ (6013) = -14.36, $p$ < .001 ($n$ = 6015) |
| Depression at 18 years *** | 5.33 (5.02) | 7.64 (6.21) | $t$ (3331) = -11.63, $p$ < .001 ($n$ = 3333) |

[a] Confounding variable

*$p$ <.05. **$p$ <.01. ***$p$ <.001